

42 - mill
9 Explorers 43 - grasshopper
36 Explorers grainside

The Alberta School

A Magazine for Classroom Service

OCTOBER 1926 Vol. 1 # 2



PUBLISHED MONTHLY

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A Magazine for Classroom Service

TABLE OF CONTENTS

OCTOBER, 1926

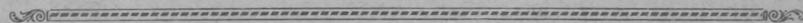


| | Page |
|---|------|
| 1. Editorial | 3 |
| 2. The Monthly Outline | 5 |
| 3. Friday Afternoon | 8 |
| 4. <u>History, Grade V.</u> | 9 |
| 5. Composition, Grade VI. | 20 |
| 6. <u>Nature Study, Grade VI.</u> | 31 |
| 7. <u>History, Grade VII.</u> | 34 |
| 8. Agriculture, Grades VII., VIII. | 41 |



OUR ADVERTISERS

| | Page |
|---|------------|
| 1. Institute of Applied Art., Ltd., Classroom Helps, Inside Front Cover | 1 |
| 2. J. E. S. McClung, Optometrist | 2 |
| 3. Ash Bros., Watchmakers and Jewelers | 4 |
| 4. White and Wood, Barristers and Solicitors | 7 |
| 5. E. N. Kennedy, Stationery, Novelties, Kodaks, etc. | 8 |
| 6. Robinson Tailoring Co. | 19 |
| 7. Jones & Cross, Ltd., Pianos and Phonographs | 30 |
| 8. J. Garnet Pearson, Typewriters and Radio Supplies | 33 |
| 9. Reliable Printing Co., Ltd., Commercial Printers | 40 |
| 10. Edmonton City Dairy Co., Ltd., Milk, Cream, Ice Cream | 42 |
| 11. Alta. College, Music, Academic, Commercial, Correspondence | 55 |
| 12. E. N. Moyer Co., Ltd., Teachers' Aids | 56 |
| 13. Institute of Applied Art, Ltd., Classroom Helps, Inside Back Cover | |
| 14. Province of Alberta, Savings Certificates | Back Cover |



OUR EYES

Before discussing the visual defects of school children referred to in this space in our last article, let us first see what vision or sight really is. The eyes have been referred to as "Windows of the soul", a better if less poetic expression would be "The cameras of the brain".

To thoroughly understand how different conditions may affect the eyes, let us first clearly understand of what the seeing apparatus consists and how it compares with a camera.

The front, transparent portion of the eye the "Cornea" in conjunction with the "crystalline lens" serve the same purpose as the lens of a camera, namely, to bring light rays to a focus on a film or screen. This screen in the eye is in reality a delicate membrane composed of an infinite number of nerve fibres formed by a spreading out of the "Optic nerve".

While we say we "see" with the eye, this is not strictly true. Although the image is formed in the eye, vision really takes place in the brain. The eye merely receives the little inverted picture on the retina. There the impression is instantly conveyed to the brain by the optic nerve.

The diaphragm of the camera is adjusted to regulate the amount of light entering the same. The pupil of the eye (a hole in the Iris), serves the same purpose, only it adjusts itself automatically according to the intensity of the light falling upon it. The camera is focussed by adjusting the distance between the lens and film. Focussing in the eye again takes place automatically. It is performed by the "Ciliary-Muscle", a ring-like muscle surrounding the lens, the curvature of which it increases or decreases according to the distance of the object viewed. This function is called "accommodation".

Abnormal structural and functional conditions of the human eye will be discussed in this space in the subsequent issues of this magazine.

The following registered optometrists specialize **exclusively** in the correction of Visual Defects:

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EDITORIAL

The methods of modern business are commonly held up as a type to which the methods employed in other lines of activity should conform. The reason is that business methods are efficient: they produce a maximum return at a minimum cost in time, labor, and materials. Such methods involve the use of time-saving and labor-saving devices, and the establishing of routine procedures. The effectiveness of these methods is checked by the use of objective standards. In so far as possible, mere opinion and guess-work are eliminated.

What place is there for business methods in the classroom?

To begin with, there is need in the classroom for an effective method of filing notes and communications from parents and school-board officials. One or two letter files will meet this need. Before they are filed all communications should be date-stamped.

Then for answering letters, the use of a typewriter is to be recommended. Typewritten letters are more legible, more impressive, and less subject to mis-interpretation than hurriedly scribbled letters. Along with the use of a small portable typewriter goes the use of a liberal supply of letter paper of a uniform size and style. In this way the teacher can ensure that he is able to answer all correspondence promptly, and with but a small outlay of time. Carbon copies of all letters should be made, and these filed. These copies will avoid wrangling and trouble at some future time.

Again, in filing and tabulating of pupils' marks, class records, and other such data, there is a plan for a definite routine procedure, and for permanent—preferably, printed—forms of a uniform style. In this way the teacher can obviate that marvellous tendency of all school records to vanish, as if by magic, at the very time when they are most urgently needed.

There are many opportunities for the use of labor-saving devices in the classroom. A set of examination papers, for example, can be prepared quickly and conveni-

ently by the use of a typewriter and a few sheets of duplicating paper. For a large class some form of duplicator or mimeograph may be necessary, not only in making examination papers, but in preparing review charts and summaries. A great saving in time can be effected by the use of printed pads of test papers and exercises in rapid calculation, spelling, and language work. Certain types of these are now available which have been standardized, and which can be marked or checked with speed and accuracy. The great value of these forms consists in the fact that they provide an objective standard for measuring what the pupil knows. They depart from the old-time procedure of "putting down marks" on a basis of what the teacher can guess that his pupils know.



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The Monthly Outline

OCTOBER

GRADE VIII.

Arithmetic:—Simple Percentage, Profit and Loss.

Literature:—The Italian in England, The Road Waterer. Memorize "Work".

Supplementary Reading:—Ben Hur, Books II, III, and IV. Summaries entitled "Ben Hur's Home and how it came to ruin"; "Life on the Galleys"; "The Life at Antioch".

Oral Reading:—The Brook.

Composition:—Suffixes -ion, -ard, -craft, -ship, -kin, -lock, -ward. A letter ordering goods. Addressing envelopes. Paraphrasing. Selection of interesting topics about which to write, and short compositions on such topics.

Spelling:—Columns I and II, first term and 10 from supp. list.

Grammar:—Analysis of simple sentences. Review of the parts of speech. The noun: Kinds, modes of forming, plural, gender forms, the three simple cases. The pronoun.

History:—Complete Parts I and II of the course.

Civics:—Part (b): The Government of the Province.

Agriculture:—As in the lessons in this issue.

Geography:—Complete study of England.

Hygiene:—Digestive system, circulatory system, respiratory system.

GRADE VII.

Arithmetic:—Volumes and areas, bills and accounts.

Literature:—King Arthur and His Knights, Treasure Island.

Silent Reading:—The Four-Horse Race, Treasure Island.

Oral Reading:—The Revenge.

Memorization:—The Hayfield, The Corn Husker.

Composition:—Stating a series of sentences on a given topic in logical order, making of compound and complex sentences (without these names), use of commas. Reproduction of stories.

Grammar:—Subject with enlargement. Predicate with enlargement. (Both word and phrase).

Spelling:—Columns I and II, first term; one column of confusing words, and one supplementary column.

Citizenship:—History notes as in this issue.

Geography:—Complete South America. Eurasia to the completion of the river systems.

Hygiene:—The secretory system.

Agriculture:—Leguminous hay crops. The parts of plants with functions of each.

Writing:—The small loop letters, the capitals B, R, M, N, Y, W.

GRADE VI.

Arithmetic:—Addition and subtraction of fractions, Sec. 4 (b), (c).

Literature:—Sherwood. Memorize: "Splendors of the Days".

Oral Reading:—The Burial of Moses.

Dramatization:—The Wrestling Match.

Supplementary Reading:—Uncle Tom's Cabin.

Composition:—As in this issue.

Spelling:—Take three words from 1.3 list, three from 1.4 list, one from 1.5 list, five from supplementary list and five from Demons.

Citizenship and History:—Harold, Hereward, Feudal Organization, William I., The Crusades, Robin Hood, Langton.

Nature Study:—As in this issue.

Geography:—Complete North America as outlined in the course, Canada to be studied late in the term.

Hygiene:—The circulatory system, how to keep it pure and the importance of this.

Writing:—m, n, o, d, E, L, I, J, 7, 2.

GRADE V.

Arithmetic:—Long measure—Reduction, addition, subtraction, multiplication and division of numbers in terms of this denomination.

Oral Reading:—A Roman's Honor, The Song Sparrow.

Silent Reading:—Robinson Crusoe.

Literature:—Crusoe (Memory) Lucy, Ingratitude, Heaven Is Not Reached.

Story Telling:—Three Fables (Dog and His Shadow, Crow and Pitcher, Lion and Mouse).

Composition:—Continuation of September topics. Teach the paragraph. Pupils to write and speak simple paragraphs. Test questions for comprehension of selections read by teacher.

Spelling:—Ten words from the lists. 5 Supp. words. Dictation.

History and Citizenship:—As in this issue.

Writing:—t, l, b, h, k, s, r, x, P, B, R, H, K, Q, L, D.

Nature Study:—Game birds and animals game laws, animals of the neighborhood and their characteristics.

GRADE IV.

Arithmetic:—Complete Multiplication Tables to 12 times. Three problems a day chiefly oral. Useful fractions. Stress rapid work in subtraction.

Literature:—Edith Cavell Fairies of Caldon Low.

Oral Reading:—Hiawatha's Hunting, Maggie and Tom, Columbus and the Egg.

Silent Reading:—Indian Summer Carol, Wonderful Journey, An Explorer's Boyhood.

Memorization:—Canadian Herd Boy.

Composition:—Continue with September work. Letter writing dealing with one topic. Use of apostrophe. Suggested topic of letters—A Visit to the City (or to the Farm), Digging Potatoes, A Bon-Fire, Threshing Time.

Spelling:—As in September outline.

Writing:—m, n, x, v, y, z, p; M, N, V, U, Y, W.

Hygiene:—The Skeleton.

GRADE III.

Arithmetic:—Notation in numbers of four to six digits. Roman Notation to 100. Addition in carrying up to hundreds. Problems.

Literature:—Snow White and the Seven Dwarfs.

Memory:—The Duel.

Stories:—Merry Animal Tales.

Oral Reading:—Reader, pages 30-35.

Supplementary Reading:—Winston Reader or similar book.

Composition:—Reproduction of short stories such as Aesop's Fables. Children to complete a half-told story of the teacher's. Reproduction of the reading lessons. Drill on too, two, to; there, their, and similar forms.

Spelling:—Continue as in September.

Citizenship:—School rules, sense of responsibility, Sunday observance, Stories from history.

Nature Study:—Collection of grains, recognition of poplar, Balm of Gilead, willow, life history of the rabbit, planting bulbs outdoors or indoors.

Hygiene:—Safety first at crossings, with fires, and in use of electric appliances.

Writing:—Practice in Capitals, and small letters.

GRADE II.

Arithmetic:—Add 2 to each number from 2 to 99. Subtract 2 from each number, 100-2. Count in any hundred by 2's and 10's. Teach cent, dollar and the signs of these.

Oral Reading:—The Water and the Pitcher. The Sandman. Wolf! Wolf!

Silent Reading:—In a Minute. The Mouse and the Lion.

Memorization:—The Owl and the Pussy Cat. Bed in Summer. Frogs at School.

Literature:—What Broke the China Pitcher. Sleeping Beauty.

Composition: Dramatization:—The Hare and the Tortoise. Teach capital for names. Review "I have", "I got" in their correct use.

Spelling:—Second column—42 words. Two word families.

Writing:—Review all one space letters, and give special stress on two space letters (t,d) and three space letters (l, b, etc.)

GRADE I.

Arithmetic:—Counting 1-20. Recognition of groups of objects making 4 and 5. Teaching figures 5, 6, 7. Comparison of objects in size.

Reading:—On the blackboard give Tom Tinker, Jack Sprat, Betty Pringle, The Little Red Hen. Recognition of tree, went, up, loved, me, under some, chicks, come, I love, I fed, I have, I had, It said, They said, hill, broke, crown, pail, down, fell. Phonics—m, e, a, s, ee.

Language and Literature:—Correct pronunciation of "yes" and drill in the correct use of "I saw". Memorization and dramatization of Hi Diddle Diddle, Little Miss Muffett, Little Bo Peep, Betty Blue, Little Boy Blue.

Writing:—Teach 1, 2, 3, 4, 5, 6, u, n, m. Some words from the reading lessons are copied.

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FRIDAY AFTERNOON

ANSWERS TO RIDDLES

1. Eleven pairs of pears were hanging from the tree. Each knight took a pear; so there were eleven pears left.
2. The teeth.
3. Noise.
4. A broom.
5. Both shrink from washing.
6. Coal.
7. A star.
8. A one-eyed man takes one of the two apples on a tree.
9. It had more "sense".
10. One—"I".
11. A watch.
12. Her husband.
13. A candle.
14. Because it has scales on it.
16. The letter "m".
17. A well.

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History—Grade V.

By Mary Crawford, B.A., Instructor in History, Victoria High School
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CHAPTER II.

THE ADVENTURES OF THE EARLY EXPLORERS IN THE NORTH-WEST

LESSON 1

TRADING BEGINS ON HUDSON'S BAY

The North-West Passage.—During the fourteenth and fifteenth centuries the merchants of Europe were carrying on an extensive trade with the countries of the Orient. **The people of the West demanded more and more of the silks from China and Japan, and the spices and tea from India** and the adjoining islands. The goods had to be carried overland by caravan to the Black Sea or the shores of the Mediterranean; thence by water to the western world. The Turks gradually got control of most of that country, and of the seaports. They increased the toll on goods, so that by the time the merchandise had reached the towns in Europe, the prices were very high. **Hence the merchants wanted a new route to the East that would be free from tolls.** This demand led bold seamen to venture forth on the Atlantic Ocean to **find a north-west passage to China.** Christopher Columbus reached America in 1492. The stories of his voyages fired the imagination of others, and in the next one hundred and fifty years Frenchmen, Spaniards, Portuguese, and Englishmen took up the search.

Henry Hudson was the first Englishman to enter America from the north. In July, 1610, after a dangerous voyage, his little high-decked craft, the "Discovery", butted through the ice-drive of Hudson Strait, and the navigator saw before him a great inland sea that rocked to an ocean tide. Was this the Pacific?—the Western Sea? They steered south-west, and came into a yellowish expanse of water under a sky as blue as turquoise; it may be that Hudson recalled sailor yarns of China's seas lying yellow under skies as blue as a robin's egg. At any rate they sailed on and on; when suddenly, to their dismay they saw the western shore turn south and bar their path.

Fearful lest, if their course did not lead to China, their provisions would not last until they could reach England, they turned south and wintered on the shores of James Bay. Of game there was abundance—rabbit, deer and grouse.

But Hudson's men refused to hunt, and as winter wore on, became more and more sullen.

In June they prepared to return to England. Somewhere out in the Bay, Hudson and the eight members of the crew who were loyal to him were seized by the others, put into a boat and set adrift. The deserters sailed off in the "Discovery". That is all we know of Henry Hudson. Several attempts were made to rescue him, but never a trace was found of the man whose gallant attempt and pitiful failure gave to the world a new empire.

Groseilliers and Radisson. — The next men to extend British interests in Western Canada were two Frenchmen, Medard Chouart des Groseilliers and Pierre Esprit Radisson—known to the English as "Mr. Radishes and Mr. Gooseberry". In the spring of 1652, Radisson, then a boy of seventeen, set out from his home in Three Rivers for a day's hunting. Fearful of the Iroquois who swarmed in the neighbourhood, the two boys with him turned back; but Pierre went on alone. When about to turn homeward at the end of the day he was seized by the Iroquois. He did not yield without a struggle, and his bravery appealed to the Indians, who spared his life and gave him as a son to a woman who had been adopted by the tribe.

He escaped again, but almost at once was recaptured. This time he could hope for nothing but death by torture. The Great Council of the tribe met to decide his case; his adopted father appealed for him, and then his adopted mother glided into the wigwam, singing some battle song of valour, dancing and gesticulating round and round the lodge in dizzy serpentine circling. The old chiefs were disturbed; one after another rose and spoke; in the end, the captive's bonds were cut and amid shouts of applause **he was set free**. He made his way to the New England colonies on the east coast, visited New York, journeyed with some Dutch merchants to Amsterdam in Holland, joined a fishing fleet there, and finally in 1654 he was back in Three Rivers.

But the spirit of adventure was strong in him. Stories brought to the trading post by the Indians of far distant waters called Lake "Quinipeg", of Crees who spent their summers on Hudson's Bay, and of strange wild races whose territory extended north-west and north through lands where beaver were plentiful to the nameless seas, roused him to deed of daring; and within a few months he was off again with his brother-in-law, Groseilliers, a trader, to **discover new lands and bring back furs**.

The only record we have of their **three voyages** is an account written by Radisson. He claimed to have discovered the Mississippi, and to have travelled overland as far as the shore of Hudson's Bay. But his story shows so little idea of distances and dates that it cannot be relied upon. However, it is certain that **they reached the country where the buffalo roamed**, and tapped new sources for the

fur trade. On their return to Quebec, Groseilliers was made a prisoner for trading without a license, and both were heavily fined. They went to France to seek redress from the King; but it was in vain. Finally, they interested some of the shipowners in Boston in their story. They were taken to England and presented to the King. He listened in amazement to their marvellous stories and was easily persuaded by his cousin, Prince Rupert, to give them ships, supplies, men, and a charter for trading in the Hudson's Bay territory.

In June, 1668 Radisson, on the **Eaglet**, and Groseilliers, on the **Nonsuch**, set sail for America. The Eaglet was disabled and forced to return. The Nonsuch went on, and the next spring came back to England with such a cargo of furs from the Hudson's Bay as English merchants had never before dreamed of. The adventurers lost no time. By 1670 they had won from King Charles a charter to the "**Governor and Company of Adventurers of England trading into Hudson's Bay**". That is, they were granted the **sole right of trade** in the Hudson's Bay territory, and in any territory westward that they might discover. Other traders were forbidden in that region, and the Company's traders were **allowed to make war for the benefit of trade**. In this way was formed the Hudson's Bay Company, which has played a very important part in the history of Western Canada. To found the first trading posts in the West, and to cause Canada to be British, were the achievements of these two adventurous spirits.

Later, they turned from the service of the English and took part in the expeditions for the French. Groseilliers died in New France. Radisson went back to the Hudson's Bay Company, and ended his days in London.

LESSON 2

THE SEARCH FOR THE WESTERN SEA

La Verendrye and His Sons.—The trail of adventure in the West on which Groseilliers and Radisson had set out was to be blazed still further by roving spirits of New France, chief among them **Pierre Gaultier de la Verendrye and his four sons**. The elder Verendrye was born, and spent his boyhood, in the palisaded town of Three Rivers, where his father was governor. We can imagine him as a boy at the age when boys today are in school, crouched before the great log fire in his father's low, rambling house, chin on hand, listening wide-eyed to the tales of the outlaw traders, the **courreurs-de-bois** who came to Three Rivers with wonderful packs of furs, and stirring stories of the land that lay far toward the setting sun. They told him of mighty rivers and great lakes. Some of these they had seen; others, they had heard of from the Indians. Always he heard rumours of a great **Mer de l'Ouest** or **Western Sea**, somewhere beyond Lake Superior. How far? Who could

tell? The boy even at an early age determined to discover that sea, not so much for his own advantage as for the glory and honour of his native country.

Meanwhile, as there were nine other children to provide for and his father had only a small salary, the lad had to shift for himself. In those days, there was practically only one career for a gentleman's son, that of a soldier. Accordingly, Pierre **entered the army as a cadet** at the age of twelve. After several years' service with the French in border warfare, he sailed to France and spent five years fighting in European wars. But in 1711, the **spirit of adventure summoned him back** to a great exploit of discovery in his native land—that of finding the Western Sea.

Years went by before it was possible for him to realize his ambitions. He married, and settled down to the business of looking after the trading post of La Gabelle. Here his four sons were born. In 1726 his chance came. **He accepted eagerly an offer of command of an important trading post on Lake Nipigon**, knowing that might lead to a chance to explore.

One day there came to him at the trading post an Indian named **Ochagach**. According to his story, he had travelled west until he came to a **great lake out of which a river flowed westward**. He had paddled down the river until he reached a point where **the water ebbed and flowed**. Through fear of the savage tribes he had not gone to its mouth, but he had been told that the river emptied into a great salt lake or sea, upon the coasts of which dwelt men of terrifying appearance who lived in fortified towns. He had been told that these men wore armour and rode on horseback and that great ships visited the towns which they had built on the coast. This story answered so closely to his own dream that La Verendrye determined to equip an **expedition for the discovery of the elusive sea**.

He returned to Quebec and persuaded the Governor to ask the King of France to provide him with one hundred men, supplies, and equipment. But King Louis was deeply engaged in wars at this time, and could not spare the money. All he would grant **was a monopoly of the Western fur trade**. That is, Verendrye was allowed to build forts in the country he explored, and out of the profits of the fur trade, to pay the costs of the expedition. With a monopoly in his favour, he interested the **merchants of Montreal** in the idea of making profits from the fur trade, and they agreed to pay the costs of equipping the expedition. Birch bark canoes were procured and loaded with provisions, equipment, and packages of goods for trade with the Indians; and in the early summer of 1731 all was ready for the great western adventure. With the father went his three sons, Jean-Baptiste, Pierre, Francois; his nephew, La Jemeraye; a Jesuit priest; and Ochagach to act as guide.

They embarked at Montreal, paddled for days up the Ottawa river; then carried their canoes over into a series of small lakes and creeks that led to Lake Nipissing. Thence they ran down the French River to Lake Huron. Launching out fearlessly on this great lake, they paddled swiftly along the north shore to Fort Michilimackinac. After resting here a day or two they steered their way out on to Lake Superior. Here they began to encounter real hardship. They found themselves in the midst of a dark and sombre sea whose waves were seldom still. Even in midsummer the water was icy cold, and the keen wind forced them to put on extra clothing. Slowly they made their way along the north shore, and by August 26th, they had reached the fur post at Kaministiquia, near what is now Fort William on Lake Superior. From here La Jemeraye went on with half the men to build a fort at Rainy Lake; while the father and the others remained where they were for the winter, and kept the company supplied with provisions.

In the next ten years, La Verendrye and his gallant band, overcoming all obstacles, slowly advanced into the unknown land, building forts as they went and keeping up connection with the merchants at Montreal by sending back generous supplies of furs. Trading posts were built: At Rainy Lake, Ft. St. Pierre; at Lake of the Woods, Ft. St. Charles; and on Lake Winnipeg, Ft. Maurepas.

But they met with great difficulties and discouragements. The profits of the fur trade had not been sufficient to finance the expedition. Once, La Verendrye had to go to Montreal to make promises to those to whom he owed money; and by glowing tales of the wealth of furs in the still unexplored land, to persuade the merchants to continue their support. On his return he was grieved to learn that his nephew had died of exposure, and not long afterwards his son Jean and a party of men who had gone to Kaministiquia to bring in supplies, were massacred by the Sioux on an island in the Lake of the Woods.

Yet he pressed on. At the forks of the Assiniboine he built Fort La Reine on the site of the present city of Winnipeg. Still further west he established a post near what is now Portage la Prairie; from this point he hoped to visit the Western Sea. He hoped in vain. A visit to the Mandan Indians on the banks of the Missouri River to the south-west yielded no information about salt water in that direction; and expeditions which he pushed out to the north and west resulted in nothing more than the establishment of some new posts on the Saskatchewan: Ft. Dauphin, Ft. Bourbon and Ft. Paskoryae at a place now known as the Pas.

And now, the sons, undaunted spirits like the father, took up the search. Two Frenchmen had been left behind in the Mandan villages. These returned after several months bringing news that a number of strange Indians had come from the west to the tribes on the Missouri. They

were on horseback and brought with them many more horses to carry provisions and supplies. They reported that they had come from a **land where were white men** who wore beards and lived in brick and stone houses. They said that these men prayed to the Master of Life in great buildings where the Indians had seen them holding in their hands what must have been books with the leaves like "husks of Indian corn". **They lived on the shores of a great lake whose waters rise and fall and are unfit to drink.** This would mean tides and salt water. At last the Western Sea!

Hope once more revived. In 1742 the **two sons**, Francois, and Louis, the youngest, made their way to the Mandans on the Missouri. Thence they struck south-west, and travelled with many different tribes of Indians on the war-path until on New Year's Day, 1743, they saw rising before them in the distance **those massive snow-capped peaks** on which, so far as we know, Europeans had never looked before. Francois pushed on with a war party of Indians and actually reached the mountains; but there he was obliged to turn back as he could not find Indians to guide him over the Rockies. Before leaving the country he buried on the top of a hill a tablet of lead with the arms and inscription of the French King. In 1913 this tablet was found by a school girl as she was playing on the outskirts of the city of Pierre, South Dakota.

At this point, the elder Verendrye lost his command of the western posts, so he had to give up his work and return to Montreal. Nine years later he was restored to his position of leadership in the West. Though sixty-four years old, he was still ambitious to finish the work he had set about to do; but **he never realized his dream.** While making preparations for the expedition he was taken ill, and before the close of the year 1749 he had set out on the journey from which no man returns.

The sons desired to go on with the quest and finish their father's work but they found themselves quite overlooked. Others were given the monopoly of fur trade in the West, and with no means of supplying or supporting themselves, they could not continue; and so their splendid efforts ended in only partial success.

LESSON 3

DISCOVERIES BY SAMUEL HEARNE

While the **French** had been pushing forward by the Great Lakes to the western prairies and the valley of the Mississippi, the **English** had been carrying on the work begun by Groseilliers and Radisson in establishing themselves on the shores of Hudson's Bay. They **founded trading posts**: York Factory, one at Hayes River, and Fort Prince of Wales at the mouth of the Churchill River. At these posts the Company traded with the Indians. Each trading fort was under a governor, who was, as a rule, resplendent

in cocked hat, gold lace and silk ruffles. The discipline was strict. No one could leave the fort without special permission and no one but the governor and chief trader could talk with the Indians. For years trade was carried on entirely with the red men who came to the gates of the fort to exchange their furs for tools and trinkets. **This system broke down.** After Verendrye and his sons had built forts in the country further south, Montreal merchants organized the North-West Trading Company, took over the forts, and easily attracted the Indians to them, since the latter were glad to be saved the long journey to Hudson's Bay. The **English thus found it necessary to go inland to meet the Indians.** This led to **another era of discovery on the part of Englishmen.**

The first great journey was made by an officer of the Hudson's Bay Company, **Samuel Hearne.** As a boy, he had been trained in a rough school. He had gone to sea at the age of eleven, and in his first year out had taken in a sea fight. Later, he became a mate on one of the ships of the Hudson's Bay Company and spent several years trading and gaining a knowledge of the coast of the Bay. In 1769, when the Company needed the services of an experienced and reliable man to undertake a difficult task, the **choice fell upon Hearne**, then twenty-four years of age.

It had long been rumoured that **valuable mines of copper lay in the far north.** Indians who came to Ft. Churchill to trade reported that there was a great mound of copper beside a river that flowed north into the sea. In proof of this, they displayed ornaments and weapons rudely fashioned from the metal. News of this reached England, and the governor of the Hudson's Bay Company was instructed to send out his most daring explorers to discover unknown rivers, strange lands, copper-mines, and the North-West Passage to China. Hearne was the one who had studied most carefully the birch-bark maps sketched by the Indians, and he it was they appointed to undertake the expedition.

Two attempts failed. On the first expedition, when two hundred miles from the fort, he awoke to find his Indian companions marching off with his guns, ammunition and hatchets. There was nothing for him to do but return. A few weeks later he set out again with five Indians. They travelled on snowshoes and depended on chance game for food. In most cases it was eaten raw, as they had no means of making a fire. Sometimes food failed them entirely. For four days they travelled twenty miles a day with only snow water and pipes of tobacco to sustain them. Once, for seven days the party had no other food than a few wild berries, some old leather and some burnt bones. On such occasions, Hearne tells us, his Indians would stay their hunger with a piece of rotten deer skin or a pair of worn out moccasins. When they came to the country of large

rivers they needed a canoe. This they bought in exchange for a knife which had cost a penny in England.

Their journey had begun in February. By July they had reached a country where deer were plentiful and many Indians wandered about. The men who were acting as guides could not be persuaded to continue north-west. They wanted to follow the many tribes who were going south-west, and Hearne had no choice but to go along. Then an accident occurred which forced him to return.

One day at noon, while he was taking his bearings, he left his quadrant standing and sat down on the rocks to eat his dinner. A sudden gust of wind dashed the delicate instrument to the ground, where it lay in fragments. **Without means of telling his exact whereabouts, it was useless to go on.**

The return journey took three months. He was robbed of his tobacco, his tools and his bag of treasures. He had no winter clothing and the September nights were very cold. He would probably not have reached the fort at all had it not been for an Indian chief, Matonabbee, described by Hearne as "the most sociable, kind, and sensible Indian I have ever met".

This Indian had himself been to the Coppermine River, and early in December, less than two weeks after his return, Hearne **was off again with the Matonabbee as guide.** They took a party of Indians with dog sleighs, and, on the advice of the chiefs, a company of women to snare rabbits, catch partridges, and attend to the camping. **Hunger pursued them for days at a time.** Christmas was celebrated by starvation. Presently the Indians found signs that meant relief from famine. Tufts of hair rubbed off on the tree trunks, and tracks on the snow told them that the caribou were on their yearly journey from east to west. But there were still many difficulties before them. Half the Indians, tired of hardship, turned back; but the others pressed on. On June 21st the sun did not set; the Arctic Circle had been reached. A month later they reached the mouth of the Coppermine River. The tribe of Copper Indians, whom they found in the far north, had never seen a white man before. They examined Hearne with great curiosity: they did not like the colour of his skin and his hair they compared to a stained buffalo tail.

The Northern Sea had been found. But this was not the Passage to China; and, so far, nothing has been seen of the supposed mountains of copper. They were now led thirty miles from the sea in search of the metal. But very little copper was to be found. It was just another Indian yarn. One piece was taken which weighed four pounds. They carried it back with them to the fort, and it is now to be found among the treasures of the Hudson's Bay Company.

On the homeward journey, they changed to a more southerly route, passing through the country of what we now call Great Slave Lake. Within a year and six months from setting out, they were back in the fort. Besides the discovery of the Coppermine River, Hearne also built Cumberland House on the Saskatchewan River.

LESSON 4

ADVENTURES OF ALEXANDER MACKENZIE

The next great landmark in the exploration of the far North is the famous voyage of Alexander Mackenzie, in 1789, down the great river which bears his name to its outlet in the Arctic Ocean. For the most part, the geography of the interior of the northern part of the continent was still a mystery. Hearne had discovered Great Slave Lake; traders had brought news of the Peace River, which rises in the mountains and flows into Lake Athabaska. They knew that from there it moves on as a new river in a vast flood towards the north, carrying with it the flow from many smaller streams. They knew that this river did not flow into the Pacific, and also that such a volume of water did not make its way to the sea through the Coppermine. Hence, they concluded **there must be another river flowing into the sea**. To solve this problem became the work of Mackenzie.

He was a young Scotsman who came to Canada in 1779 to seek his fortune. He worked for almost six years for a fur-trading company of Montreal. He was then sent west to take charge of a North-West Company's trading-post on Lake Athabaska. Here, during the long winter, he amused himself by planning a journey of discovery into the unknown country of the north and west.

The following year, in June, **he set out from Lake Athabaska** with a little flotilla of birch bark canoes. In his party were four French-Canadians, a German, and several Indians for guides, one of whom had been with Hearne on the expedition to the Coppermine. **A week of travel brought them to Great Slave Lake.** As far as the eye could see, the surface of the lake presented an unbroken sheet of ice. Only along the shore had narrow lanes of water appeared. Here they remained for two weeks suffering much from exposure to the heavy rain and bitter cold. **Then the ice began slowly to break;** strong winds drove it towards the north, and the canoes were able to pass, though with great danger. **By the first day of July they were floating down the great river to the Arctic.**

The Indians, at sight of the canoes and voyagers, made off and hid among the rocks and trees beside the river. They could not understand the language spoken by the Indians of the expedition; they seemed not to know what tobacco was; and even fire-water did not attract them. Knives, hatchets, and tools, however, they accepted with

great eagerness. They urged Mackenzie not to continue north. The sea, they said, was so far away that many winters would pass and he would be an old man before he could complete the voyage. Moreover, they said, there were cataracts he could not pass, there were no wild animals for food, and the whole country was haunted by monsters. The daring Scotsman persisted, however, and with the generous bribe of kettle, axe and knife, persuaded one of this new tribe of Indians to act as guide. After five more days of travelling forth, many of the party wanted to turn back. They feared that even if they did reach the ocean they would not be able to get back to Ft. Chipewyan on Lake Athabaska before winter. Mackenzie finally agreed that if after seven days more they did not reach the northern ocean, they would turn south again.

He kept the agreement and also achieved his purpose. By July 12th, they were in the land where the sun shines brilliantly all night long. The party encamped on an island that rose to a considerable height. Mackenzie and "English Chief", his guide, climbed to the highest point on the island, and there to the west and north they could see a broad field of solid ice that marked the Arctic Ocean. He hurried back to camp, eager to tell the others the good news. That night when they were about to retire to rest under the full light of the unsinking sun, the wash of the Arctic tide, threatening to swamp their baggage proved beyond all doubt that they had actually reached the sea.

They remained there for three days watching the tide and the whales. Once they were rash enough to go out in a canoe in pursuit of one of the monsters. Only the fog saved them. On July 14th they set out again. It had taken six weeks to reach the Arctic. It took eight more to make the return journey against the stream.

Three years later Mackenzie made another voyage, this time to the Pacific. On his way back from the Arctic he had been frequently in view of the Rockies, and the Indians had told him of rivers on the other side of the mountains, that flowed into the sea. He had tried to persuade them to guide him to one of these rivers, but without success. In 1792, however, he got permission from the Company to make an attempt to cross the mountains and go to the Pacific by way of the Peace River, *Smoky R. - Fraser*.

He set out in May, 1793. In less than a week they were in the midst of snow-capped mountains and angry waters foaming in deep, narrow canyons. It was with great difficulty that they made a landing. The men bluntly declared that it was absurd to go on, but Mackenzie paid no heed to their murmurings. He gave them the best feast he could, then set out again. They came to the source of the Fraser which the Indians said ran for "many moons" through the "shining mountains" before it reached the "mid-day sun". They had to retrace their steps somewhat

and take another route. But this time Mackenzie's men stood by him, and within eleven days they had reached the sea. Taking a mixture of vermillion and grease, he painted on the face of a rock this memorial of his visit:

"Alexander Mackenzie from Canada by land, twenty-second of July, seventeen-hundred and ninety-three. Latitude 52d. 20m. 48s."

A little more than a month later they were back at the fort.

In the following winter **Mackenzie left the West for good**. He published the story of his travels and was knighted by the English King. After some years of quiet life he died on his estate in Scotland.

Other Explorers.—A year before Mackenzie's arrival at the Pacific Coast, it had been surveyed by **George Vancouver**, an English navigator. He went far up the coast and sailed around the island which is named after him.

In 1808, **Simon Fraser** made his way to the **Pacific** by the river from which Mackenzie turned back, now called the Fraser River.

In 1811, **David Thompson**, known to the Indians as "Koo-Koo-Sint"—"the man that reads the stars"—made the voyage to the Coast by way of the **Columbia River**.

Between 1820 and 1845, **Sir John Franklin** made three voyages to the Arctic. On the third, he tried to sail around the northern coast of Canada, from the **Atlantic to the Pacific**—in other words, to discover the North-West Passage. **From this voyage he never returned.**

In 1905, a Norwegian named **Roald Amundsen** made his way from the **Atlantic to the Pacific**, succeeding where Franklin had failed. It was he who later discovered the South Pole.

Between 1824 and 1850 the **Hudson's Bay Company's servants** endured many hardships in an effort to open up the **Yukon** territory. They were dependent for food on animals and moss. At one time they were so far reduced they had to eat their parchment windows and the lacings of their snow-shoes. The work of exploring this territory thoroughly was completed by the **prospectors and miners of 1898**, who searched every corner for new supplies of the precious metal.

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Composition—Grade VI.

By A. J. Watson, B.A., Supt. of Schools, Lethbridge

OCTOBER OUTLINE

(14 Lessons; 27 Exercises)

(Note: These lessons are based upon the assumption that the pupils already have the groundwork outlined in the Composition Manual, Grade V, and the September outline for Grade VI.)

Lesson 17—Paragraph study — definite reference to the key-word.

Lesson 18—Two key-words in the topic sentence.

Lesson 19—Essay subject: "Hercules".
Oral preparation for essay writing.

Lesson 20—Name words, or nouns.

Lesson 21—The gender of nouns.

Lesson 22—Gender of nouns (continued).

Lesson 23—Essay subject: "The Lark at the Diggings".
Oral preparation for essay writing.

Lesson 24—Shall, will.

Lesson 25—Between, among.

Lesson 26—Repetition of words; review.

Lesson 27—Pronunciation, vocabulary, and dictionary practice.

Lesson 28—Correct use of words.

Lesson 29—Correction of errors.

Lesson 30—Abbreviations and enlargements.

Lesson 31—Essay subject (original): "A Hallowe'en Party".

LESSON 17

PARAGRAPH STUDY: DEFINITE REFERENCE TO KEY-WORD

The relation of other sentences with the topic sentence of the paragraph may be obtained in an easy manner. This is by using **definite** words to refer directly to the key-word or some other important part of the topic sentence.

While this is a common method of connecting sentences with the topic sentence, it is not used as extensively in every paragraph as in the following examples and exercise. Nevertheless, there are few paragraphs that do not have some evidence of it. Observe the following:—

"It happened one summer that a **woodchuck** made its burrow in the side of a hill near Mr. Webster's house. On warm, dark nights **it** would come down into the garden and eat the tender leaves of the cabbages and other plants that

were growing there. Nobody knew how much harm it might do in the end. Daniel and his elder brother Ezekiel made up their minds to catch the little **thief**. They tried this thing and that, but for a long time **he** was too cunning for them. Then they built a strong trap where the **woodchuck** would be sure to walk into it; and the next morning there **he** was."

You will notice that the reader is not allowed to lose sight of the key-word for a single moment. Each sentence has a definite word referring to "woodchuck". The writer carefully avoids repetition of the same word too often. The words that are repeated are small and well separated. The whole paragraph is bound together by the use of these words which definitely refer to the key-word. **This uniting of each sentence to the topic sentence** gives to the paragraph the quality we call **Unity**. (Unity means "one-ness", or that the paragraph is all about one topic.)

Select the topic sentence and the key-word in each of the following paragraphs. By using a diagram, as in the sample paragraph, join each sentence to the key-word.

EXERCISE A.

When the early Spanish adventurers penetrated from the seaboard of America into the great central prairie region, they beheld for the first time a strange animal whose countless numbers covered the face of the country. When DeSoto had been buried in the dark waters of the Mississippi, the remnant of his band, pursuing their western way, entered the "country of the wild cows." When in the same year explorers pushed their way northward from Mexico into the region of the Rio del Norte, they looked over immense plains black with moving beasts. Nearly one hundred years later, settlers on the coast of New England heard from westward-hailing Indians of huge beasts on the shores of a great lake not many days' journey to the north-west. Naturalists in Europe, hearing of the new animal, named it the bison; but the colonists united in calling it the buffalo.

EXERCISE B.

Of course the little boy was sent to school. He loved to read, but did not like to study. Sometimes his teacher would see him with his eyes shut and his hand moving on the desk. He was thinking of a picture. Drawing was not taught in the schools in those days and boys were punished if they were caught drawing pictures during school hours; so Edwin often ran away from his teachers, and they would find him in a quiet corner, with his slate, drawing the picture of some animal.

EXERCISE C.

An old barn was fitted up for a studio, which was soon made beautiful with pictures of all kinds of animals. There were graceful greyhounds, kind-faced sheep dogs, faithful

terriers, soft rabbits, cunning kittens, spirited race horses, and fleet-footed deer. The pictures looked so real that a witty friend of the artist used to call out before he entered the studio, "Land-seer, keep you dogs off me; I want to come in." On another occasion this same friend said, "O, give me a pin to take the thorn out of that dog's foot! See what pain he is suffering!"

EXERCISE D.

One night the little beavers followed their parents into the woods and watched them cut down a tree. The father stood up on his hind legs, propping himself with his tail, and began to cut a notch around the trunk. The mother helped on the other side. They gnawed upwards and downwards, digging out huge chips with their chisel teeth. The circle grew deeper and deeper, till the father's head was almost hidden whenever he thrust it in to take a fresh bite. When finally the wood cracked and the tree-top began to sway, all the family scampered away to the pond. They dived for the tunnel and hid in the house for a while. There was danger that some hungry wildcat had heard the crash of the branches and had hurried there to catch them for its supper.

EXERCISE E.

The grasshopper lives much in the grass, and his chief motion is in hops, or long jumps. He has another name, "the murmurer." This is given him because of the noise or song he makes. His song is loud and shrill. It is made by rubbing his wings one upon the other. He has a little piece of skin like a tight drumhead set in each wing. As he moves his wings, this tiny drum vibrates, or trembles, and makes the shrill sound. Mrs. Grasshopper does not have this drum in her wings.

EXERCISE F.

Among those who had been wounded, and lay helpless on the hillside, was Captain James Secord of Queenstown. Laura Secord, his wife, had watched the battle from a distance, and hearing of his danger rushed up the hill to his aid. While she knelt at his side, three American soldiers attempted to kill him, but the slender, pale-faced woman stood in front of her wounded husband and called for help. The captain of the cowardly soldiers ordered them away, and Laura Secord, believing her husband to be dead, lifted him in her arms and carried him to their home. It was soon found that he still lived, and his wife's tender nursing saved his life.

LESSON 18

TWO KEY-WORDS IN THE TOPIC SENTENCE

Sometimes a topic sentence has two or more key-words, though one is usually more important than the other. In such cases **unity** may be preserved in the succeeding sen-

tences by definite words which refer to either of the key-words. Sometimes, also, the so-called key-word may be a phrase or group of words. Frequently the sentences will alternately refer to each key-word. Observe the following:

“A sleek gray-faced prairie **wolf!** his pointed **black nose** tucked in between his **four feet** drawn snugly together; his handsome **bushy tail** wound over his nose and feet; a **coyote** fast asleep in the shadow of a bunch of grass!—this is what **Iktomi** spied. Carefully **he** raised one foot and cautiously reached out with his toes. Gently, gently **he** lifted the foot behind and placed it before the other. Thus **he** came nearer and nearer to the round fur ball lying motionless under the sage grass.”

You will note that the topic sentence is farther from the beginning of the paragraph than usual, and that it has two important key-words, namely, **coyote** and **Iktomi**. The first part of the paragraph refers altogether to coyote and the last to Iktomi.

In the following exercises select the topic sentence and key-word or words. By using a diagram show how unity is obtained and preserved:—

EXERCISE A.

The living chain now commenced swinging back and forth like a pendulum. The motion was slight at first, but gradually increased, the monkey at the lower end striking his hands against the ground and pushing out with all his strength. This was kept up until the end of the chain was thrown among the branches of the tree on the opposite bank. One of these the lowermost monkey caught and held fast. The chain now reached from one side of the stream to the other, forming a living bridge over which all the other monkeys young and old, passed without confusion or delay.

EXERCISE B.

It began to grow upon my mind that the grasshopper looked very much like an old man. His face, with the big, solemn eyes and straight mouth, was like an old man's face. He wore a gray coat, like a loose duster. He had a wrinkled greenish vest. He wore knee-breeches and long red stockings. The more I looked at him, the more he looked like a little, grave, old-time man who came to visit my aged grandfather. But I thought my grasshopper in the bottle felt like a prisoner. I said, “Now you may go, my Old Man of the Meadow.”

EXERCISE C.

One June day a number of officers entered the house and commanded Mrs. Secord to give them food. She pretended to be a very humble and dull person, and began at once to prepare the meal. In the meantime the officers discussed their general's plans, and did not pay much attention

to the woman who had appeared so simple. Laura Secord, however, listened to all they said, and discovered that they intended to surprise the little handful of soldiers who were defending Beaver Dam, and capture Lieutenant Fitzgibbon, the officer in charge.

EXERCISE D.

One morning the magician set out with Aladdin to show him something very wonderful. At length they came to a valley which separated two mountains. Aladdin was directed to gather dry sticks and kindle a fire. When this was done, the magician, pronouncing certain magical words, cast a perfume into the blaze. Immediately a great smoke arose, the earth trembled and opened, showing a large, flat stone. Then he said to the frightened boy, "There is hidden under that stone an immense treasure, which you may possess if you will carefully follow my instructions." Aladdin promised exact obedience. The magician then embraced him, and putting a ring which would protect him from danger upon his finger, bade him pronounce the names of his father and his grandfather and raise the stone. Aladdin obeyed, and discovered a hole several feet deep, and steps to descend lower.

EXERCISE E.

As I sat by her, feeling lonely and miserable, my master came into the stable. I could not bear to look at him. He had killed my mother. There she lay, a little gaunt, scarred creature, starved and worried to death by him. She would never again look kindly at me, or curl up to me at night to keep me warm. Oh, how I hated her murderer! Still I kept quiet till he walked up to me and kicked at me. My heart was nearly broken, and I could stand no more. I flew at him and gave him a savage bite on the ankle.

LESSON 19

ORAL PREPARATION FOR ESSAY WRITING

ESSAY SUBJECT: "HERCULES"

The story of Hercules is especially attractive for pupils of this grade because of the adventures of this hero. More than one story may be related and reproduced by the class. Hercules had twelve adventurous undertakings to perform. At least three of these should be told before the essay is written, and in the plan each adventure may be made the topic of a paragraph. In the reproduction of these stories, the pupils should endeavor to make them as exciting and interesting as possible. Hercules may also be taken as the representative of a good force fighting against wide-spread evils, and thus the account may be applied in a practical manner to present conditions.

LESSON 20

NAME WORDS OR NOUNS

Observe this sentence:—

John went to **town** to buy a **sleigh**.

John is the name of a person. **Town** is the name of a place. **Sleigh** is the name of a thing. All these are called name words or nouns. Therefore a **name word or noun is the name of a person, or a place, or a thing.**

EXERCISE A.

Oct. 31 Select the nouns in these sentences:—

1. A woodman lived in the forest with his wife and children.
2. His axe slipped from his hand and fell into the water.
3. He saw a bright light and heard a sweet voice.
4. The fairy sank beneath the water.
5. In a moment she brought up a silver axe in her arms.
6. The man met a lazy neighbor.
7. He was a rogue and told a lie.
8. The black cloud in the west will bring a storm.
9. Marygold picked buttercups and dandelions.
10. The bird flew about all day looking for food.

EXERCISE B.

Oct. 31 Underline the subject and predicate and select the nouns in each sentence:—

1. The little girl had no dolls or toys.
2. In the summer the birds flew about among the trees.
3. One year her mother could not earn any money.
4. The little sparrow flew down the chimney and into the room.
5. The wind howled around the lighthouse.
6. All night the father and daughter listened to the cries of the sailors.
7. After a great effort the boat was launched.
8. Many people came to see the young girl.
9. On warm days the cavemen did not need houses.
10. One day a wild animal entered the hut or cave.

LESSON 21

THE GENDER OF NOUNS

Nouns that are the names of males are called **masculine** nouns, as—king, master, prince, boy.

Those that are the names of females are called **feminine** nouns, as—queen, mistress, princess, girl.

Some nouns may refer to either males or females and are said to be **common** in gender, as—child, sheep, leader, baby.

All other nouns are said to be **neuter** in gender.

Thus all nouns have one of four genders; namely, masculine, feminine, common or neuter.

EXERCISE A. *all*

Oct 37 Select the nouns. State the gender of each. Where possible give the corresponding noun of opposite gender:—

1. The girl rambled off into the woods, chasing the bees, and listening to the songs of the birds.
2. The big bear was called the great papa, from his rough, shaggy coat.
3. The smell of the soup made Silverlocks hungry, and she saw a bowl with a spoon beside it.
4. Bruin opened his mouth and frightened Silverlocks.
5. The sparrow hopped up to the frog with her head on one side.
6. "I am waiting for Providence to send a fly," he said.
7. "Hello, Froggie," cried the sparrow. "You there still!"
8. After the bird was gone, the frog observed a blue butterfly sitting in a blade of grass.
9. Froggie had scarcely closed his eyes when a rustling sound made him open them.
10. The little sparrow told the children all poor Froggie's history.

LESSON 22 *1934*

GENDER OF NOUNS (Continued)

Oct 37 Learn the following list of nouns of opposite gender:— brother, sister; earl, countess; husband, wife; lad, lass; tiger, tigress; sir, madam; uncle, aunt; wizard, witch; beau, belle; hero, heroine; count, countess; boy, girl; lion, lioness; heir, heiress; host, hostess; Jew, Jewess; shepherd, shepherdess; prophet, prophetess; abbot, abbess; actor, actress; hunter, huntress; negro, negress; fox, vixen; Czar, Czarina; waiter, waitress; master, mistress; emperor, empress; governor, governess; landlord, landlady; monk, nun; drake, duck; son, daughter; lord, lady; widower, widow; nephew, niece; Sultan, Sultana.

EXERCISE A.

Oct 37 Rewrite each sentence using the noun of opposite gender in each instance:—

1. The prophet was a Jew.
2. The emperor consulted the wizard about the prince.
3. The tiger killed the heir of the count.
4. The hunter shot a lioness on his landlord's estate.
5. The actress was the belle of the party.
6. The maid was a shepherdess in France.
7. He employed a negress as waitress in the hotel.
8. His uncle was governor of Texas.
9. The lad pleased his host who was his aunt's husband.
10. The landlady told the negro to leave.

LESSON 23

ORAL PREPARATION FOR ESSAY WRITING

ESSAY SUBJECT: "THE LARK AT THE DIGGINGS"

This story should include a full account of the origin of the miners, and the struggle of early pioneers in Australia. It is a good subject for illustrating loyalty and patriotism in the hearts of colonist and convict alike, and of showing the strength of early influences in later life. It is a story that should arouse sympathy and pity in the children's minds, and this should be clearly shown in the manner of relating or writing it. If desired, it is quite easy to dramatize this subject.

LESSON 24

SHALL AND WILL

In speaking and writing, **shall** and **will** are often used incorrectly when we wish to show that something is about to occur. This can be avoided by observing a very simple rule.

When we expect that something is about to occur, we should use **shall** if the subject is **I** or **we**; if the subject is any other word we should use **will**. Thus:—

I **shall** go there as soon as possible.

We **shall** see him at the hotel.

But:—

He **will** go there as soon as possible.

My uncle **will** see him at the hotel.

You **will** find the ball in the ditch.

On the other hand, if we wish to indicate that we are determined that something shall occur, or if we promise that it will occur, the rule is turned around; and then we must use **will** if the subject is **I** or **we**, and **shall** for any other subject. Thus:—

I **will** go there in spite of the weather.

We **will** make him pay for it.

But:—

You **shall** go to school today.

She **shall** learn her lessons.

The boy **shall** be punished.

EXERCISE A.

Select the proper word in brackets to complete each sentence:—

1. "You (will, shall) not have that mouse," said the little cat.
2. I wonder if it (will, shall) rain this afternoon.
3. "The soldiers (will, shall) attack the enemy," said the officer.
4. Where (will, shall) we hide from them?
5. "I (will, shall) try again," she said.

6. No person (will, shall) believe your story.
7. The children (will, shall) be glad to see their father.
8. "We (will, shall) ask for nothing more," said the beggars.
9. The birds (will, shall) sing for you today.
10. I (will, shall) cut the grain myself.

LESSON 25

BETWEEN AND AMONG

These words are frequently mis-used. They are prepositions and are always followed by a noun or a word that takes the place of a noun. If the noun refers to only **two** persons or things, we should use **between**. If it refers to **more than two**, we should use **among**. Thus:—

Divide the apples **between** John and James.

But:—

Divide the apples **among** the class.

Another common error is using "I" instead of "me" after "between".

Thus:—

Let us keep the secret **between** you and **I**.

This should be:—

Let us keep the secret **between** you and **me**.

EXERCISE A.

Select the proper word in brackets to complete each sentence:—

1. The river flows (between, among) its banks.
2. The boat was jammed (between, among) the rocks.
3. There was a game (between, among) our team and the collège.
4. He lost the ball (between, among) the grass.
5. The child fell (between, among) the car rails.
6. There was a quarrel (between, among) John and his sister.
7. The boy and girl divided the nuts (between, among) them.
8. The team ran away when the reins fell (between, among) them.
9. That couple never quarrel (between, among) themselves.
10. The fox swam (between, among) the flock of ducks.

LESSON 26

REPETITION OF WORDS—REVIEW

1. This sentence is not a good sentence as it has the word sentence **too** many times in it.
2. Strawberry plants should be planted with the plants two feet apart.
3. This mistake is a worse mistake than the mistakes you made in the last exercise.

4. These palm trees are different from the palm trees of the tropics.
5. You should water the plants with soft water as hard water is too hard on them.
6. He tracked the fox by its tracks although the tracks led across the deep snow.
7. He humored the audience with humorous stories to put them in good humor for his speech.
8. Can you spell all the spellings in your last spelling lesson?
9. It is a terrible feeling to be constantly in terror of a terrible accident.
10. The princess robed herself in flowing robes that were more beautiful than the robes of the queen.

LESSON 27

Pronounce, find the meaning, mark the accent, and use each word correctly in a sentence:—

(Selected from "The Rescue")

EXERCISE A.

wonderfully
water-courses
trudged
leaden
relaxing
especially
floundering
hurdled
violent
tufting
elements

EXERCISE B.

swirls
chisel
patterns
cornice
channelled
chine
converging
castled
anxious
ells
scooped

EXERCISE C.

plaintive
appeal
patronage
vapor
exuding
gamboge
hoggets
antre
frizzled
sheppety
moisture

LESSON 28

EXERCISE A.

Use each word correctly in a sentence:—

plum, plumb, prophet, profit, weather, whether, deer, dear, isle, aisle, seen, scene, psalm, boughs, bows.

EXERCISE B.

Use each word correctly in a sentence:—

beech, beach, statue, statute, plait, plate, brooch, broach, guest, guessed, pastor, pasture, custom, costume, medal, meddle.

LESSON 29

Correct the following errors:—

1. Every one of the boys have hung their hats in the wrong place.
2. This young soldier was more kinder than the rest.
3. He is by far the best of the two men.
4. We want to hurry. The school bell has rang.

5. You must try and do these here questions.
6. Can I have the loan of five cents till tomorrow?
7. The old man don't do nothing but set or lay all day long.
8. Would you go if you was me?
9. We done that many times before our parents come home.
10. The train gets in at a quarter of four.
Review all errors in the monitor's list.

✓ Oct 37 *alt*
LESSON 30

Write the following abbreviations in full and use each correctly in a sentence:—

G.G., N.Y., M.P., Cal., C.N.R., I.O.O.F., C.O.D., B.A., M.D., H.R.H.

LESSON 31**ORAL PREPARATION FOR ESSAY WRITING****ESSAY SUBJECT (ORIGINAL): "A HALLOWE'EN PARTY"**

The pupils should be prepared to give an account of such an event without previous assistance from the teacher. Care should be taken to assign the lesson a few days earlier. An account of the party may be supplemented by any Hallowe'en stories related by the pupils. The majority of the children have had some personal experiences which they will be quite ready to tell. If the oral lesson is thus made interesting, the task of writing the essay will be very much simplified.

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Nature Study—Grade VI.

WHY LEAVES FALL FROM THE TREES IN AUTUMN

It is often supposed that the frosts in October cause the leaves to fall from the trees; in other words, that the leaves become frozen and dead and as a result they wither and fall off. This is hardly the truth. The fact is, that the leaves of most of the trees native to Alberta would fall off regardless of whether frosts had occurred or not. They fall off because their work is done. The leaves have fed the plant during the season of growth, the spring and summer. New wood is formed, and flowers and seeds have been produced. Now the work of the present year is completed and nature makes preparation for shedding the leaves. The food contained in them is first drained off into the stem and branches, for Nature is not wasteful. At this stage the leaves lose their green color, and assume the colors of mineral substances left in them. Thus in October we have the rich autumn colors of the foliage, red, orange, yellow, golden brown, bronze, copper, and other shades which make the autumn woods one of the loveliest sights we see in nature. Now at the base of the leaf a callous layer forms which at length separates the leaf-stem entirely from the twig on which it grows and forces it to fall off. Thus the leaf-scar is already healed up before the leaf falls. Frosts, it is true, hasten the withering of the leaves, and the winds tear them off and scatter them.

Collect autumn leaves of the poplar, birch, willow and Balm of Gilead which show beautiful coloring. Press these in books or paste them on sheets of paper. Bring twigs into the class which show the scars where the leaves once were attached. What trees remain green throughout the year? Of what value to the tree and other plants is the covering of dead leaves on the ground?

WHAT THE TREES DO IN WINTER

Even while the leaves are falling and the woods seem dead, Nature is getting them ready for the growing of leaf and wood for the next year. At the spot where each leaf falls off there will be found buds leaning closely up against the twig for shelter and protection. In the spring these buds begin to swell with the coming of the warm days. What grows out of these buds? Not a leaf as many suppose, but a twig on which several leaves grow, and often flower and fruit.

All living plants breathe as truly as we or the animals do. While the leaves are on the branches, breathing goes on on a large scale through their surfaces. After they are

gone air still may reach the living part of the stem and keep it alive through openings in the bark. Notice on the smooth bark of the birch, alder, cherry or saskatoon the small openings which admit air. These are known as "lenticels".

All the activities of the trees are slowed up in the winter season and therefore as growth is not then taking place the leaves are not needed to supply the necessary air to keep the plant alive and supply material for growth as well.

Some plants are evergreen. The pine and spruce are examples. One should not say, however, that the leaves of these plants do not fall off. They remain on the plant from three to five years. One may see the dead pine leaves under the trees in any pine forest. The pine and spruce differ from the poplar in that the leaves do not fall off at a particular season.

Bring to the class twigs showing winter buds. How has Nature provided protection for these buds? Is it true that the brown covering prevents them from freezing? Where do buds occur as a rule? What comes from the buds in the year following? Bring to the class branches or bark showing lenticels. What is the purpose of these? Why are leaves not really necessary in winter as they are in summer? Give two reasons for believing that the leaves of the pine and spruce fall off.

THE STARS IN OCTOBER

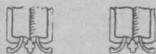
Winter is the season of starry nights. It is well for each child that he learn the names of some of the most beautiful of the stars and groups of stars and a few interesting facts about them.

The most noticeable of all the stars are the planets which move across the sky as the sun and moon do and in about the same direction from East to West in the southern part of the heavens. Three bright planets may be seen this month. Jupiter, the largest of the planets, and the most brilliant of the stars, may be seen near the moon on October 16th. Mars is a reddish star seen near the moon on the 22nd. Venus is brightest toward the setting sun and may be seen in the neighborhood of the moon on the 4th of November. This nearness to or "conjunction" with the moon is an easy way of finding the planets, and the dates are given in various magazines and newspapers at the beginning of the month.

The "fixed" stars are so called because they form a pattern which never changes, at least so far as we can see, from year to year. They are therefore more easily located than the planets. The Great Dipper may be seen low in the northern sky at nine o'clock. It consists of seven bright stars, one of them double, forming a dipper, or, as the an-

clients thought, a "Great Bear". The two stars on the outer edge of the "dipper" point to the Pole Star or North Star. Notice, too, the Milky Way, or Galaxy, a cloudy band of millions of small stars reaching across the heavens from the north-east to the south-west.

Make a drawing of the Dipper and mark the North Star in line with the pointers. Why does the name "Great Bear" seem unsuitable? Why has it been named "Charles' Wain"? Of what value to us is it to know the North Star? Give several ways by which one can find the directions by day and by night.



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History and Civics—Grade VII.

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LESSON III.

TUDOR ENGLAND

1. The Spirit of the Age.—The year 1485 when Henry VII. came to the throne is usually taken as beginning the period of Modern History. The change from mediaeval to modern times was, of course, a gradual development covering a long period of years, but at this time the changes were rapid enough to mark the coming of a new era. It was a time of great discoveries and inventions, of intellectual progress and growing freedom of thought, of new ideas in art, politics, and literature, and above all, of a renewed search after truth. The old social order had gone to decay, and the leaders in the life of the nation were men of the new middle class of wealthy merchants, who replaced the titled nobility of the middle ages.

2. The Fall of Constantinople.—In 1453 Constantinople was captured by the Turks, and scholars of the Byzantine Empire who were well versed in the ancient Greek and Roman literature, took refuge in Italy. In France, Germany, and England, as well as in Italy men became interested in the ancient classics which had for centuries been almost neglected. This revival of the study of Greek and Latin, and the new freedom of mind that went with it, is known as the “New Learning” or the “Renaissance”.

3. The New Learning in England.—The study of the ancient languages was encouraged by the leading men of England. John Colet, the son of a rich London merchant, having studied in Italy, returned to Oxford and for eight years lectured on the Greek text of the New Testament. He also founded St. Paul’s Grammar School, London, where boys might begin the study of Latin and Greek. Bishop Foxe, Henry VIII.’s chancellor, founded Corpus Christi College, Oxford, where the classics were a special subject of study. Erasmus, the greatest scholar of the age, a native of Rotterdam, came to England to live so that he might have part in the wonderful awakening of English intellectual life, and to help with his counsel. The greatest book of the time was written by Sir Thomas More, a romance entitled *Eutopia*, in which the faults of governments and of prevailing customs were contrasted with those of an imaginary perfect society in his kingdom of “Nowhere”.

4. The Invention of Printing.—One of the most important events in the history of civilization is the invention of printing by the use of movable type. The first presses were

used in Germany about the middle of the fifteenth century. In 1476 Caxton introduced the first printing press into England. Altogether eighty books were set up in type and printed by him. Books were now much cheaper than formerly when each volume had to be written out with great labor by hand, and the clearer and more legible printed page as well as the fact that an unlimited number of copies could be made, were reasons why books quickly came into general use.

5. England Becomes Protestant.—Four great events of the last half of the fifteenth century may be shown to have relation with each other. These are the capture of Constantinople by the Turks, the New Learning, the invention of printing, and the Protestant Reformation. The last of these was to some extent the result of the freeing of men's minds as a result of the more general use of books, and of the study of the ancient classics. The Reformation began in Germany where Martin Luther, a monk, began to attack the teaching of the Catholic church. In England the Reformation was due to Henry VIII.'s break with Rome owing to the refusal of the Pope to grant the divorce which Henry desired from his wife, Katherine of Arragon. By the Act of Supremacy 1534, Parliament declared the King supreme head of the Church in England. It was Henry's wish that the Catholic services in the churches should be continued, for he was no Lutheran. The monasteries, however, were dissolved, because the monks were disposed to side with the Pope against Henry. The vast treasures of gold and jewels, and the enormous estates of the monasteries were seized by Cromwell, who was the king's minister, and the proceeds scattered prodigally among the nobility and those who helped in the confiscations. Under Edward VI. the Reformation, by the influence of the Protector, Somerset, and Cranmer, Archbishop of Canterbury, was hastened. An English Prayer Book was introduced, and more church property was seized, from the proceeds of which the Grammar Schools of Edward VI. were built. Under his successor Mary, who was a Catholic and half-Spanish, the Catholic Church was restored and the Protestant leaders burned at the stake. The religious question in England was at length settled under Elizabeth. Her policy was to take a "middle way" between the extreme Protestants and the Catholics. The supremacy of the sovereign in Church matters was affirmed by Parliament and an Act of Uniformity required the use of the Prayer Book in the church services.

6. Queen Elizabeth and Spain.—Spain was the chief Catholic power, and its ruler, Philip II. had several reasons for desiring to crush Elizabeth and England. Mary Queen of Scots had been executed for plotting against Elizabeth. The Pope now proclaimed a crusade against Elizabeth which Philip at once undertook to carry out. Moreover, the Spanish treasure-ships coming from America had been plun-

dered and the Spanish colonies attacked by English privateers, while Elizabeth had sent help in money and an army the Dutch who were in rebellion against Spain. For these causes Philip prepared a fleet of over 130 ships with which to attack England, naming it the Invincible Armada. It set sail in May, 1588. The aim of the Spanish commander was to reach Holland and take on board an army which was then to be landed on the east coast of England. The Armada was roughly handled by the English fleet under the command of Lord Howard who was assisted by Drake, Hawkins, and others. The English ships had the advantage in being more quickly manoeuvred than the Spanish galleons, while they were lower in the water and were adapted for firing broadsides. The Armada attempted to return to Spain by way of northern Scotland. Sixty-seven ships were wrecked on the shores of Scotland and Ireland or were lost in the storms and only 52 ships returned to Spain.

7. British Supremacy on the Sea.—The results of the defeat of the Armada were chiefly three: 1. The Protestant settlement in England remained and England was saved from a Spanish invasion. 2. The Dutch were now enabled to gain their freedom from Spain. 3. The English were supreme on the seas and the power of Spain began to decline. The expansion of England was due in a large measure to the courage of her seamen, chief among whom were Raleigh, Hawkins, Drake, Frobisher, and Gilbert. By their efforts the Spanish claims in America were challenged, the Armada was defeated, colonies were founded in America, and a beginning made in exploration in the direction of the North-West passage.

8. The Bible in English.—The first English Bible was that of John Wycliffe who in Edward III.'s reign translated from the Latin Vulgate most of the New Testament and part of the Old Testament in order that the people might be able to read it in their own tongue. It was not till the time of the Reformation in the reign of Henry VIII. that the Bible really became accessible to the people in English. A partial translation was completed by Tyndale, and Henry authorized Miles Coverdale to issue his complete translation of the Bible which was based on the work of Tyndale in 1536. The Bible selections of the Anglican Prayer Book are from this source. In 1611 the "Authorized" or "King James" version of the Bible was completed. As a book in common use by all the people, it has helped to fix the standards of English speech, and it remains, from a literary point of view alone, the most valued treasure of the English people.

9. The Golden Age of English Literature.—This is a term used to describe the Elizabethan era which was famous for its poets and prose writers. The most noted of these was Shakespeare whose poems and plays are the greatest

works of the kind in English literature. Some of the noted literary men with their works are:

The Earl of Surrey, Sir Thomas Wyatt—Sonnets.
Christopher Marlowe, Dramas: Faustus, Tamerlane.
Ben Jonson, Dramas: Volpone, The Alchemist.
Beaumont and Fletcher, Dramas: The Knight of the Burning Pestle.
Raleigh—A History of the World.
Shakespeare, Dramas and Poems: Merchant of Venice, Hamlet, etc.
Spenser, Poems: The Faerie Queene.
Sir Francis Bacon—Essays, History, Philosophy.
Sir Philip Sidney, Poetry and Romance: Arcadia.

QUESTIONS—LESSON 3.

1. What was the "New Learning"? Show that it was really a very old learning.
2. Show the relation of the fall of Constantinople to the Renaissance. What spirit was thus created in Western Europe?
3. What was the part taken in the Renaissance movement by each of the following: Colet, Erasmus, Sir Thomas More?
4. Compare the old way of making books before the time of Caxton with that in use now. What was the effect of the invention on the use of books and on the spread of learning?
5. What brought about the Reformation in Germany and in England?
6. Tell of the progress of the Reformation in the reigns of Henry VIII. and Edward VI., its setback under Mary, and its completion under Elizabeth.
7. What were the causes of the attack of Spain on England in the reign of Elizabeth? Describe the Armada, and the battle in which it was defeated.
8. What were the results of the defeat of the Armada?
9. Tell about three Bible translations into English. What has been the effect on our language of the King James translation?
10. Name the famous literary men of the Elizabethan era. Give some of the works of each.

LESSON IV.

THE AGE OF DISCOVERY

1. The period of the Renaissance was also the time of the world's greatest voyages of discovery. The desire uppermost in men's minds was to find a route by sea to India, the wealth of which was considered to be very great. The overland route and that by way of the Mediterranean Sea and the Isthmus of Suez was beset with pirates and was regarded as dangerous. The first to explore the water route via Cape of Good Hope were the Portuguese. In 1488 Bar-

tholomew Diaz reached the southern point of the continent of Africa. In 1498 Vasco da Gama rounded the Cape and finally reached India. He landed at Calcutta, exchanged presents with the king, and traded with the natives. On his return to Lisbon by the same route he was greatly honored by his countrymen. His cargo also repaid his expenses many times over.

2. **Columbus.**—It was a native of Genoa in Italy who earned for Spain the honor of discovering the western continent. Columbus was convinced that the earth was a sphere, and that Japan and India might be reached by sailing westward. After pleading for years for help from the monarchs of Spain to prove that his theory was correct, he was fitted out by Queen Isabella with three ships, and after a tedious voyage, land was at length sighted. It was one of the Bahama Islands, and was named San Salvador. Believing that he had reached India, he called the natives Indians and the islands the West Indies.

3. **The Cabots.**—The first discoverer of Canada was a native of Genoa also, John Cabot, who with the support of Henry VII. and the merchants of Bristol made the voyage in the little ship, the Matthew in 1497, and landed on Cape Breton. On a second voyage he explored the coast of America from Newfoundland to Cape Chesapeake. His son Sebastian accompanied him on this trip, and it was on his report of the presence of numerous codfish on the Banks of Newfoundland that fishermen from England and France were first led to the Grand Banks.

4. **Magellan.**—It was twenty-seven years after the first voyage of Columbus that his theory of the roundness of the earth was proven first by men sailing round it. Magellan in 1517 set sail from Spain westward to South America. He felt his way down the coast of that continent, passed through the straits that bear his name, and reached the Philippine Islands in 1521. His death took place in that region in a fight with the natives. One of his ships, the Victoria, continued on to Spain, thus completing the first circumnavigation of the globe. Magellan, although a native of Portugal, was in the service of King Charles V. of Spain. The fact that Magellan had visited the Philippines coming from the east, and now reached them coming from the west, was the first actual proof that the world is round.

BEGINNINGS OF GREATER BRITAIN

1. **The Expansion of England.**—It was in Elizabeth's reign that the English first took to a sea-faring life, although their Germanic ancestors had been famous searovers. There were several reasons why the English in Elizabeth's time became a maritime power. In the first place, it was a time of increasing prosperity, and there were men in each port who could supply the money to build a

ship and stock it with a cargo, as well as hire the men to man the ship. The stories of Spanish and Portuguese wealth obtained in America and the Indies also stimulated sailors and merchants to seek wealth in overseas trade. Privateering became a profession, and, robbing Spanish treasure ships was looked upon as lawful adventure, for the Spanish were hated as being persecutors of the Protestants in Holland and in Spain.

At first the English did not seek to colonize the countries they visited as the Spanish had done. They set out from port with the intention always of returning. Perhaps we are indebted to Hakluyt more than to any other man of those times for interest that was later shown in colonization. Hakluyt is an Elizabethan writer whose prose work "The Principal Navigations" is an account of the voyages of Englishmen from the earliest times to his own day. He urged on Elizabeth and her advisers the need of occupying the region north of Florida to forestall possible Spanish occupation of it. Hakluyt was especially active in securing support for Raleigh's colony in Virginia.

2. **Sir Francis Drake.**—Drake is one of the "Devonshire Worthies" among whom are numbered also Hawkins, Raleigh, Gilbert and Grenville, who did so much to win for England supremacy on the seas under Elizabeth. He had sailed with Hawkins trading in slaves between Africa and America. At Panama he had seen the Pacific from a mountain top, and it was his ambition to enter that ocean and raid the towns and treasure ships of the Spaniards. Drake set sail in 1577 with a fleet of five ships, passed the Straits of Magellan and entered the Pacific. He raided the cities of Valparaiso, Lima and Panama, taking much treasure. By this time only one of his ships was left, the Golden Hind. With it he sailed north as far as the present city of San Francisco. Then he set out westward across the Pacific for England, deciding not to return by the way he came for fear of the Spaniards. He reached England in 1580. For his great exploit the Queen made him a knight. Drake was chief in command under Lord Howard in the attack on the Armada in 1588. He died of fever at Panama while on another expedition for the purpose of attacking the Spanish colonies.

3. **Sir Walter Raleigh.**—Raleigh was a man of many different interests, being a soldier, a poet, a historian, a sailor, and a colonizer. He was a favorite at the court of Queen Elizabeth and from her he received a grant of land in America which was named Virginia in honor of the Queen. Two attempts of his to establish colonists there failed, the settlers either being starved out or adopting the wild life of the natives. He brought the potato and the tobacco plant to England. Raleigh was executed in the reign of James I. for having made an attack on a Spanish town in America.

4. Sir Humphrey Gilbert.—Gilbert was the first Englishman to attempt to establish a colony in America. He sailed for America with five ships, and, landing at St. John's, Newfoundland, took possession of the Island in the name of the Queen. Gilbert planned to make Newfoundland a colony where Englishmen could earn a livelihood with the fisheries and on the land. On his return, however, his ship was sunk in a storm and he was drowned.

QUESTIONS—LESSON 4.

1. What European visitors are supposed to have reached America before Columbus?
2. What instrument for guiding sailors did Columbus possess?
3. What belief as to the shape of the earth did Columbus hold? What may have been the reasons for his believing this?
4. Where was Columbus born? Who gave him help in men and ships for his voyage? Where did he land in America? What error did he make in regard to the locality?
5. Describe the work of exploration of John Cabot. What results came from it? Why do some claim that he is the real discoverer of the mainland of America?
6. Where is the Strait of Magellan? Whence does it get its name? Give a brief account of the voyage of Magellan.
7. Why did the English become a sea-faring nation in Elizabeth's time?
8. Name famous men of Devon of the Elizabethan period.
9. Write an account of Drake's great exploit.
10. Tell the story of the "Red Cloak" of Raleigh, and of the favors the Queen bestowed on him.
11. Show the varied interests Raleigh was concerned with.
12. Write a short account of Gilbert's voyage.



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Agriculture A—Grades VII and VIII

Insect Enemies of Wheat.—Damage is caused to our wheat crop by two insects: (1) the **grasshopper**, or **locust**, and (2) the **wheat-stem sawfly**.

What is an Insect?—The word “insect”, like the word “bug”, is often loosely applied in common speech to any minute animal. In Zoology—the science of animal life—and also in Agriculture, the term **insect** denotes a class of animals which in the adult stage have **three body divisions**, and **just three pairs of legs**. The body divisions are the **head**, the **thorax**, and the **abdomen**. The six legs are attached to the thorax. A spider is not an insect.

An insect bears also a pair of **antennae**, or “feelers” on the head, and either **one pair** or **two pairs** of wings on the thorax. It has **two compound eyes**, and usually one or more simple eyes. It has no internal bony skeleton, but instead, a hard, **horny body covering**, which protects the body and makes it rigid. Insects breathe air through a system of **tubes (tracheae)** that open directly on the surface of the body covering.

Metamorphosis.—Only **adult insects** have wings, and when the wings are fully developed, growth ceases. The adult performs two functions: it feeds, and it lays eggs.

The eggs hatch into **immature insects**, known either as **larvae** or **nymphs**, accordingly as they do or do not differ greatly in form and habits from adult insects. A **larva**, or “grub”, feeds voraciously on tender plant leaves or shoots for a time; then it passes into a resting stage, becoming an inactive **pupa**. From this quiescent state it later emerges as an adult insect, or **imago**. Many larvae, when they “pupate”, spin a feltlike covering of silk about themselves. Such a pupa covering, or **cocoon**, is to be distinguished from the pupa enclosed within it. A **nymph**, on the other hand, is quite similar in form and habits to the adult; except that it is smaller, and has no wings. It does not “pupate”, or pass through a resting stage. This change from immature insect—larva or nymph—to adult insect is termed **metamorphosis**. When there is a pupa stage the metamorphosis is said to be **complete**; when there is no pupa stage the metamorphosis is **incomplete**. Cutworms and tent caterpillars have a complete metamorphosis; but grasshoppers have an incomplete metamorphosis.

The main function of nymphs and larvae is **rapid growth**. They are therefore very active in getting food. The damage done to crops by destructive insects occurs mainly during the nymph or larva stage. **Biting insects** have mouth parts adapted for biting and chewing, and eat the foliage and stems of plants. **Sucking insects** have mouth parts adapted for piercing and sucking: they bore into the stem of a plant and suck out the sap.

Entomology, or the study and classification of insects, is a science having a very important bearing on crop production; for insect pests can be controlled successfully only when the life history and the habits of the insects are thoroughly known. For this reason

"The Cow, the Mother of Prosperity"

(Contributed by the Edmonton City Dairy)

When one sees a farm with barns, silos and cows, one finds a home with convenience, a debt-free farmer, a good citizen, and good agriculture. Canada needs more cows; cows to give milk to boys and girls in the cities and on the farms—muscle-making and bone-making food; cows to give a year-round income, to counteract the fear of crop failure, to furnish an incentive to crop-rotation; cows to make the farms into homes and not just places to stay.

Every farmer who keeps either one cow or a dozen cows wants to get the most and best milk, the most and best profit. To get the most and best he must (1) Have the right kind of cows; (2) Give the cows the right kind of care; (3) Handle the milk in the best way.

Given a good cow to start with, the cow will do her part if the farmer does his. If she is to make a profit it should be remembered that: (1) Nobody ever got far in dairying by buying most of the feed; (2) The cow needs enough of the right kind of foods—a silo is almost as necessary in dairying as the cows themselves; (3) The barn should be comfortable, light, clean, ventilated; (4) The cow's body being 70 per cent. water and her milk 85 per cent. water—she needs to drink 8 to 15 gallons of water a day; (5) She needs kind treatment.

But if we do our best for the cow, we must do our best for the milk. This means that we must KEEP THE MILK CLEAN. Dirt spoils milk; when fresh manure gets into the milk 85 per cent. of it dissolves, and straining will not remove it. Here are some "Don'ts" that make clean milk:

Don't have a foggy, dusty, dirty barn.

Don't haul manure or feed the pigs and then milk the cows unless clothes are changed and hands washed.

Don't let someone feed the cows or clean out the barn while milking is being done.

Don't moisten the hands with milk; they drip.

Don't have dirty cows; clean hips, flanks and udder especially.

Don't use an open pail for milking. It gathers 100 per cent. more dirt than a hooded one.

Don't keep the milk in musty cellars or near onions, cabbages or decaying vegetables.

Don't use unwashed utensils.

DON'T HAVE DIRTY MILK.

Milk that is to be kept should be cooled immediately it comes from the cow. Bacteria make milk sour. Bacteria do not work in cold milk. Bacteria multiply by millions in warm milk.

For keeping men and women young and healthy, two quarts of milk a day will prove more efficient than the monkey glands, sanitariums, mud-baths, patent medicines, or whatever belated device men may devise for restoring wasted physical strength.

bulletins on insect control are issued from time to time by the Dominion Entomologist at Ottawa, and by the University of Alberta, and the Alberta Department of Agriculture. An uncontrolled insect pest may cause a loss to our farmers of millions of dollars in one season.

Grasshoppers or Locusts.—Locusts are brown grasshoppers with short antennae; other grasshoppers are green in color, with long slender antennae. The injurious grasshoppers of Alberta are the following:—

1. **The Lesser Migratory Locust:** *Melanoplus atlantis*. Its front wings have a row of about eight small brown spots in a straight line along the middle of each. The hind wings are colorless.

2. **The Roadside Grasshopper, or Pellucid Locust:** *Cannula pellucida*. This species has semi-transparent front wings, with about four large irregular brown blotches on each. The hind wings are colorless, or faintly yellow.

3. **The Two-Striped Grasshopper:** *Melanoplus bivittatus*. This species is yellow, with two black stripes along the back. The nymphs are bright green, and are often found in rye fields.

Habits of Grasshoppers.—In late summer or early fall, the female, by means of a "digger", or **ovipositor**, on the end of the abdomen, digs a small hole in the ground and deposits about 25 eggs, glued together in a compact mass, or **egg pod**. Several of these egg pods will be deposited by the same female. In the following spring, about the end of May, the eggs hatch, and the **nymphs** appear. In about 45 days thereafter, the nymphs are full grown, having in the meantime **moulted** about five times.

The winged adults are strong fliers. Migratory locusts, when searching for food, will fly high in the air for hundreds of miles, in swarms.

Roadside grasshoppers lay their eggs in sod on heavy soil. The nymphs require tender, green vegetation. During a succession of dry years, they will leave their usual breeding grounds, where they are kept in check by parasites, and migrate to wheat fields, where there are no parasites to keep them under control. As a result, they increase to enormous numbers, and become a pest. Migratory locusts deposit their eggs in stubble or weedy summerfallows, on light sandy soil.

Control of Grasshoppers.—The following methods are employed by the farmer:—

1. **Ploughing** weedy summerfallows in fall or early spring.
2. **Burning** patches of weeds or dead grass, which serve as a shelter for the nymphs. The burning is done after dark, when the nymphs have returned to shelter for the night. If straw is first scattered over the weeds or grass, the burning is more effective.

3. **Scattering poisoned bait.**—Grasshoppers, being biting insects, can be killed by poisoned bait. The poison used is Paris Green or white arsenic. Two pounds of the poison are mixed dry with fifty pounds of bran or of sawdust. Then five gallons of water, in which is dissolved a quart of molasses and two pounds of salt, is stirred into the poisoned bran or sawdust. The bait is scattered in a moist crumbly condition over the infested ground, ten pounds of bait to

every acre. On cold, damp days the nymphs do not feed. Hence the bait should be scattered only on clear, bright days; and early in the morning—preferably, about two hours after sunrise. The scattering of bait should be repeated several times, at intervals of about five days.

The Wheat-Stem Sawfly.—This insect resembles a small wasp. The abdomen, however, is tipped, not with a sting, but with a pair of saws, by means of which the insect cuts a slit in grass stems or wheat stems for the purpose of depositing eggs. The eggs, laid usually in early June, hatch in a short time; and the grubs go down the wheat stem, eating their way through the nodes to the bottom. They pass into the ground about two inches, turn around, and return to a point a little above the level of the ground, where, just before the grain is ripe, they gnaw a ring around the inside of the straw. The straw above the ring breaks off and falls to the ground; the part below the ring serves as a resting place for the grub until the following June, when it emerges as an adult sawfly. The grub is yellowish white in color, and is without legs. It has dark mouth parts and a pale brown tail. When removed from the wheat stem it curls up in an S-shaped fashion.

The sawfly lives normally in grass stems. In 1896 it began to attack wheat stems on the edges of wheatfields in Southern Manitoba. In succeeding years it penetrated the fields to greater distances, until by 1926, it had spread to the centre of nearly every wheatfield of Manitoba and Southern Saskatchewan, destroying in some fields as much as 90% of the crop. In the meantime it had been working steadily westward, reaching Alberta in 1913. It is now beginning to spread to the centre of the wheatfields in some localities.

Control of the Sawfly.—Just what causes the sawfly to transfer its habitat from grass stems to wheat stems, is not yet understood. It seems clear, however, that the enemy parasites which attack the sawflies in grass stems, are unable to get at the sawflies in wheat stems; with the result that the wheat stem sawfly is multiplying very rapidly. The artificial methods of control are the following:—

1. **Fall ploughing.**—This imprisons the grubs and buries them so deep that they cannot escape.

2. **Early cutting.**—Since the sawfly doesn't girdle the straw until the grain is nearly ripe, cutting the grain a week early will save it. But the quality of the grain may be affected; and, of course, the grubs are not destroyed. Rye grass is attacked by sawflies. When it is cut before the middle of July, the grubs, being prevented from reaching the ground, will die.

3. **Trap crops.**—Thinly sown crop of wheat, ploughed down about the middle of July on land to be summerfallowed, will trap the sawfly grubs.

4. **Sowing immune crops.**—Oats, fall rye, barley, and solid-stemmed plants, such as flax, alfalfa, and corn, are all free from attack by the sawfly.

Note—Throughout the sections that follow and deal with "Oats", "Barley", and "Winter Rye", nothing will be said on such topics as have already been discussed under "Wheat."

OATS

History.—Oats were known to the Greeks and Romans; but not to the Hebrews, Egyptians, Chinese, or people of India. Their original home is thought to be Eastern Europe or Western Asia. Although they were cultivated by the prehistoric inhabitants of Central Europe, they did not appear till long after wheat and barley. They accordingly have been of less importance in the history of the human race. But since oats grow best in a moist, temperate climate, they have now become, in Central and Northern Europe, the most important cereal used for man's food.

Botanical Relations.—The Oat Genus (*Avena*) is not closely allied to wheat, barley, or rye. Tall Oat Grass and Velvet Grass are its closest relatives. One wild species *Avena fatua*, is much like cultivated oats. This species is classed as a noxious weed in Alberta.

Varieties of Oats.—The varieties of oats may be classified as to color—e.g. white (the most common), black or yellow; or according to the form of panicle, or flower cluster. Unlike the spikelets of wheat or barley, oat panicles, each containing two or more grains, are attached to the stem by a rather long stalk. An open panicle has the spikelets arranged spirally about the stem, and is the more common. The side panicle ("side oats" or "mane oats") has the spikelets all on one side of the stem.

The important white varieties grown in Alberta are: American Banner; Abundance—an English variety that does not breed true to type; Victory—a "comer"; Ligamo—early, but like all early varieties, low in yield.

The one yellow variety grown is Golden Rain—so good that it is often classed as white.

The important black varieties are: Joanette—an excellent feeder, being only 23% hull; Black Tartarian—rusts easily; Orloff—maturing in 65 days; Dauhency—light in yield. The first two of these varieties are side panicle or "mane" oats. They are good yielders, with plenty of straw.

Habits of Growth and Methods of Culture.—Oats develop temporary and permanent roots in a manner similar to that of wheat. The culms are larger and softer than those of wheat or rye, and are more affected by environment—i.e. by soil conditions, temperature, and moisture. They vary in height from two to five feet, the average being three and a half feet. They produce about two pounds of straw for each pound of grain; but if the soil is very rich, or has been fertilized, the proportion of straw is greater. The normal yield of straw is about one ton per acre. There is always a danger from lodging (1) if the soil is over-rich; (2) if a late variety is sown; or (3) if the seeding is late.

The hull of the oat kernel (lemma and palea) develops long before the kernel. Hence, if the variety or seeding is late, the kernels are not fully filled, and the percentage of hull in the grain is too high. Oats grown in warm countries have large hulls, and poor kernels.

Oats require a cool, moist soil—preferably a loam. They should be sown early to ensure a good growth during the cool part of the growing season. The manner of preparing the seed and seed bed, and of sowing the seed, is similar to that required for wheat. Oats,

however, will do with less preparation than wheat; and will even give a good yield on new land without cultivation. A bushel of oats weighs from 25 to 50 lbs., the standard being 34 lbs.

Centres of Production.—The world's oat crop now exceeds 4,000 millions of bushels per year, of which the United States produces more than 25 per cent., and Canada, about 12½ per cent. In Canada the oat crop stands next in importance to the wheat crop; its volume is increasing steadily with the progress of mixed farming. In Scotland, one-third of all the cultivated land is sown every year to oats, and in Ireland, the oat crop is fully one-half of the total annual grain and green crop.

Of the following tables, the first two have been compiled from the *Canada Year Book* for 1924, and the third has been taken from the *Annual Report of the Alberta Department of Agriculture* for 1924:

WORLD'S PRODUCTION OF OATS

| | 1923 Crop in Millions of Bushels | Acreage in Millions |
|---------------|-------------------------------------|------------------------|
| United States | 1223.36 | 40.83 |
| Canada | 564.00 | 14.39 |
| Germany | 387.46 | 8.26 |
| France | 317.13 | 8.46 |

FIELD CROPS OF CANADA—1923-4

| Crop: | Acreage in Thousands | Value in Millions of Dollars |
|------------------------|-------------------------|---------------------------------|
| Wheat | 22,672 | 316.9 |
| Oats | 14,388 | 184.9 |
| Barley | 2,785 | 32.6 |
| Rye | 1,448 | 11.3 |
| Peas | 169 | 5.0 |
| Potatoes | 561 | 56.4 |
| Turnips, Mangels, etc. | 195 | 22.5 |
| Hay and Clover | 9,726 | 162.9 |
| Grain Hay | 1,920 | 15.1 |
| Alfalfa | 391 | 11.9 |
| Fodder Corn | 659 | 24.6 |
| Sugar Beets | 22 | 1.4 |

FIELD CROPS OF ALBERTA—1923 AND 1924

| Crop: | Acreage in Thousands | | Value in Millions of Dollars | |
|----------------|-------------------------|-------|---------------------------------|------|
| | 1923 | 1924 | 1923 | 1924 |
| Wheat | 5,173 | 5,574 | 94.1 | 73.6 |
| Oats | 2,300 | 1,848 | 32.2 | 22.7 |
| Barley | 384 | 495 | 5.6 | 7.4 |
| Rye | 397 | 274 | 3.3 | 2.6 |
| Potatoes | 40 | 32 | 2.9 | 2.8 |
| Root Crops | 7 | 9 | 1.0 | .8 |
| Grain Hay | 1,861 | 2,427 | 12.6 | 43.7 |
| Hay and Clover | 245 | 257 | 2.4 | 3.9 |
| Alfalfa | 39 | 40 | 1.0 | 1.4 |
| Fodder Corn | 54 | 67 | .8 | 1.3 |
| Sunflower | — | 16 | — | .5 |

Uses of Oats.—On account of the high percentage of proteins in the kernels of oats, this grain makes an excellent food both for man and for young stock. It is feed whole or chopped to horses and sheep; ground or chopped, often mixed with barley chop, bran, or other meal, to cattle and hogs. As human food, it is well known in the form of rolled oats and oatmeal.

The straw of oats is a valuable **roughage** for cattle; it is also preferred for bedding. Oat straw is also used in paper making. Green oats make excellent grain hay or "green feed".

BARLEY

History.—Barley, like wheat, was cultivated by man in prehistoric times. It was used by the ancient Egyptians as food for man and beast, and also for making beer. Barley was the world's chief bread-making grain until the sixteenth century. Thereafter its place was taken by wheat. Still less barley was used after the growing of potatoes had become general in Europe. Now, despite its use for malt, barley is the least important of the world's cereals.

Botanically, the barley plant (*Hordeum sativum*) is regarded as a domestic species descended from the wild barley (*Hordeum spontaneum*) of western Asia.

Varieties.—The main types of barley are two: the six-rowed type, and the two-rowed type. There are also types that are beardless, and that are hull-less.

The two important six-rowed varieties grown in Alberta are **O.A.C. No. 21**—bred from Manchurian barley, and used for making beer—and **Manshury**. **Canadian Thorpe** and **Hannchen** are two-rowed varieties grown in Alberta.

Centres of Production.—The following table, compiled from the *Canada Year Book* for 1925, gives the important barley-producing countries of the world:—

| Country: | 1924 Crop in Millions of Bushels |
|---------------------|-------------------------------------|
| United States | 187.9 |
| India | 137.0 |
| Germany | 110.3 |
| Canada | 88.8 |
| Spain | 83.7 |
| Japan | 74.9 |

Uses.—The chief uses of barley are as follows:

1. Barley meal is a good stock-food, and in this respect, takes the same place in Europe that maize (or Indian corn) does in America. Barley meal is often mixed with oat chop or bran.
2. For malting.
3. As human food—chiefly as of "pearl barley"; i.e. the naked kernels from which the hull has been removed by special machinery.
4. Barley straw is equal in value to oat straw as a food for stock. It is also used for bedding.

WINTER RYE

History.—Rye was unknown to the Egyptians or the Greeks. It is therefore not so ancient a plant as wheat or barley. During the first century of the Christian Era rye was introduced into the Roman Empire from Eastern Europe and Western Asia; and until the middle of the nineteenth century it was the staple article of diet for the lower classes of European people. It was sown with wheat, and ground with wheat for flour. In New England it was ground with maize for flour.

Botanical Relations.—The Rye Genus (*Secale cereale*) is closely allied to Wheat and Barley. It is a cross-pollinated plant. Accordingly, it is variable in type, and has been improved by man only to a small extent. It readily escapes and becomes **feral**, or wild. Being more hardy than wheat or barley, it will grow on poor soil, and will withstand a severe winter. It is well adapted to a light, sandy soil.

Varieties.—Most of the rye grown in Alberta is known as “common rye”. It is very hardy, but is not so productive as the improved varieties, such as **North Dakota No. 959**, and **Rosen**. The former was introduced from the North Dakota Experiment Station, and the latter from the Michigan Experiment Station. Both these varieties have been grown in Alberta and Saskatchewan for several years. The latter is not so winter-hardy, and is more likely to do well in Southern Alberta than elsewhere. The University of Alberta recommends a variety known as **Alberta Rye**.

Winter Rye.—This crop has the following advantages:—

1. Since it roots well in the fall, it makes better use of the spring rains than other crops, and can therefore withstand a summer drought more successfully.
2. It makes a good pasture, both in late fall and in early spring.
3. Because of its quick, vigorous growth in fall and spring, it chokes out most of the weeds that start. It can therefore be grown with advantage on weed-infested land.
4. It ripens before wheat or oats. It is therefore not damaged by late-summer frosts, and its harvesting is not in the way of wheat harvest or oat harvest.
5. It makes hay of fair quality. Few crops will produce so much hay in a dry season. If the hay is cut early, a second growth will furnish hay, pasture, or grain.
6. When rye is seeded from July 20th to August 15th, it covers the ground with a good growth during fall, winter, and early spring. Such a crop is very effective in **preventing soil-drifting**.

These are its disadvantages:—

1. It shells readily when ripe. Thus a volunteer crop will come up the following year.
2. For this reason, wheat cannot follow a rye crop immediately without having its grade affected.

Culture.—The seed-bed is prepared as for barley or wheat. Winter rye does best following summer fallow.

The rate of seeding is the same as for wheat. For a winter crop, rye is sown about September 15th. It may be sown in May or early June for summer pasture, and in July or early August for fall pasture.

Harvesting.—Rye makes the best hay when cut in the milk stage. There will then be no second growth, however; whereas, if it is cut as it comes in head, there is usually a strong second growth. For grain, rye should be cut when still rather green, to avoid shattering as much as possible.

Diseases.—**Ergot** is a fungus that attacks rye, and is sometimes widely prevalent. A diseased head of rye appears to have a number of black, curved, pod-like growths. The straw or grain of diseased rye is troublesome to livestock. There is no treatment to prevent the disease, but seed rye may be cleaned by floating off the ergot, when the grain is poured into a barrel of water. Formalin has no effect on ergot.

Smut is occasionally found on rye in Alberta.

Centres of Production.—According to the *Canada Year Book* for 1925, the chief rye-producing countries of the world are Germany, Poland, United States, Czechoslovakia, France, and Hungary.

Uses of Rye.—In some parts of the world rye is still used as a bread cereal. The grain is also used for making whiskey. Rye straw is used to some extent for making paper.

QUESTIONS AND EXERCISES

1. Compare the roots, stem, leaves, and flower cluster of a wheat plant with those of a timothy plant. Look for outstanding resemblances and differences. Mount sections of the plant parts in your Agriculture Booklet.
2. How many wild grasses can you find in your district?
3. How does "hard wheat" differ from "soft wheat" (a) in appearance, and (b) in use?
4. Explain why it is that unfavorable September weather in Alberta affects the price of wheat.
5. Why are early varieties of wheat not, as a rule, satisfactory?
6. What are the advantages of using "pedigreed seed"?
7. Why is Edmonton interested in the question of the "Western Grain Route"?
8. Why will burning stubble in the fall not destroy grasshoppers?
9. Why are outbreaks of the roadside grasshopper likely to occur after several dry years in succession?
10. What is the danger in weedy summer fallows and weedy headlands?
11. Why is oat straw better feed than wheat straw?
12. What are the uses and advantages of winter rye?
13. Under what circumstances should wheat seeding be (a) light; (b) early?
14. Why does Central Alberta produce excellent crops of oats?
15. Explain the advantages to the producer of the "Canadian Wheat Pool".

LEGUMINOUS HAY CROPS

Kinds of Crops.—There are three chief kinds of crops: **grain crops**, **forage crops**, and **root crops**. All these crops consist of plants containing large supplies of food suitable for man or for livestock; but they differ in respect to the part of the plant in which this food

is stored. Grain crops, or cereal crops, are plants that have produced ripened seeds, in which there is a large store of food. In forage crops food is stored in the leaves and stems; and in root crops, in the roots. Now since food is stored in different parts of a plant at different stages in its growth, it follows that the same plant may serve for two or more crops, according to the time it is cut or harvested. Green oats, for example, have much food in the stem and leaves to carry on the growth of the plant. But when the plant has matured fully, this food has been transferred from the stem and leaves to the kernels in the flower. Ripe oats are a grain crop, whereas green oats make a forage crop.

Forage crops are green crops, the growing plants of which will supply roughage for animals. They are either fed green by grazing or soiling, or are cut green and then cured. In the former case the crop is **pasture**; in the latter, it is **hay** or **fodder**. **Silage** is a forage crop that has been cured by a process of partial fermentation in a silo; such as peas and oats mixed, Indian corn, and sunflowers. **Green feed**, as the term is applied in Western Canada, is properly **grain hay**; that is, a grain crop that has been cut green—usually with a binder—and cured by drying.

Other special kinds of crops are the following:—

Cover Crops.—These are grown to **prevent soil drifting**. Rye or rape are often so used.

Nurse Crops.—These are grain crops in which the seed of a grass, a legume or other plant, has been sown along with the grain seed. The grass, legume, or other plant, is the **catch crop**.

Green Manure Crops.—These crops are grown to be plowed under green. In this way they enrich the soil, and improve its texture and condition.

What is a Legume?—A **legume** is a plant belonging to an immense family of plants known as the *Leguminosae*, of which the most familiar members are peas, beans, and clover. This family is commonly known as the **Pea Family**, **Pulse Family** or **Bean Family**. Taking the common pea or bean as a type plant of this family, we may note the following characteristics of the *Leguminosae*:—

1. The leaves are **compound**; that is they are made up of several distinct leaflets. They have small leaflike appendages at the junction of the leaf stalk and the stem. These are termed **stipules**.
2. The flowers are irregular in shape, somewhat resembling a butterfly (Latin, *papilio*). They are therefore described as *papilionaceous*.
3. The stamens are usually ten in number.
4. The pistil is a **legume**; that is, a pod which splits lengthwise into two pieces at maturity.

Botanical Relations.—The *Leguminosae* embrace a very great number of herbs, many shrubs, and some tropical trees. The plants of this family with which we are familiar in Canada, have all **papilionaceous flowers**, and therefore belong to that branch of the family which is called the *Papilionaceae*, or *Fabaceae* (Latin, *faba*, a bean).

There are more genera and species of *Leguminosae* on the Western Prairies, than of any other plant family. The following are com-

mon species: Canadian Milk Vetch, prairie clover, Cow Vetch, smaller purple vetch, pale Everlasting Pea, *Hedysarum*, *Thermopsis* (Buffalo Bean), wild Liquorice, Loco Weed, white clover, alfalfa, and sweet clover.

The following are common examples of cultivated legumes: field peas, garden peas, common beans, butter beans, the Scarlet Runner, Caragana, hairy vetch, sweet clover, alfalfa, red clover, white clover, and alsike clover.

Other cultivated legumes are the following: peanuts, soy beans, cow peas, and lupines.

Legumes are classed as **annuals**, **biennials**, and **perennials**, accordingly as they live for one year, two years, or more years than two. Garden peas and beans are annuals; red clover and sweet clover are biennials; and alsike clover, alfalfa, and white clover, are perennials.

Legumes and Non-Legumes.—Of the ten elements essential for plant growth, three are taken by plants directly from air and water, and the rest are taken from the soil. Of these seven elements nitrogen is used in the largest quantities. Nitrogen fertilizers, therefore, produce greater increases in crop yields than any other fertilizers.

Nitrogen can be added to the soil in two ways: (1) by the use of nitrates, and of nitrogenous organic matter, such as dried blood (packing-plant fertilizer) and stable manure; and (2) by growing a legume crop, or green-manuring with a legume crop. But commercial fertilizers are too expensive for profitable use in general farming. The most profitable fertilizer is the legume crop.

Legumes have a very curious and remarkable ability to combine the free nitrogen of the air, which cannot be used directly by any plants, with other elements, thereby producing in the small lumps or **nodules** that form on their roots, certain nitrogenous compounds that *they* can use during growth. When these legumes decay in the soil, the nitrogenous compounds produced by them, can be absorbed from the soil by other non-legume crops. This **nitrogen-fixing**, as it is called, is performed by certain **bacteria** which live in the legume nodules.

Now all crops other than legumes, obtain their nitrogen from the soluble nitrogenous compounds of the soil. Non-legumes, therefore, **reduce the quantity of available nitrogen in the soil; legumes, on the contrary, increase the amount of available nitrogen in the soil.**

A ton of sweet clover or alfalfa contains about 50 pounds of nitrogen. If the alfalfa is fed to livestock and the manure is returned to the soil, about 30 pounds of nitrogen is put into the soil; and if the clover or alfalfa is plowed down as green manure, about 50 pounds of nitrogen is returned to the soil. This amount will produce 25 bushels of wheat. It can thus be readily understood that the wild vetches and other legumes of the prairies have played an important part in producing the great western wheat lands.

Centres of Production:—

Alfalfa—Europe, United States, the Argentine Republic, and Australia.

Red Clover—Europe, United States, Chile, New Zealand.

White Clover—Europe (Holland and Italy, especially), United States, Canada.

Alsike Clover—Temperate regions of Europe and Asia, Ontario, Eastern and Mid-Western United States.

Lupines—Europe, especially Germany.

Peanuts—Where the summers are long and hot; as in the Southern United States.

Soy Beans—Japan, China, Manchuria, Northern India, United States.

Cow Peas—Europe, Central Africa, South-Eastern Asia.

Navy Beans—Europe, United States, Canada.

Field Peas—Europe, Canada (southern provinces), United States (Michigan and Wisconsin).

Vetches—Europe, United States, Canada.

Legumes and Crop-Rotation.—Legumes should be grown in a crop rotation for the following reasons:—

1. Because a legume crop increases the available nitrogen of the soil.
2. A heavy soil is improved by a legume crop, in that it becomes lighter and less firm in texture. This result comes from the deep rooting of legumes.
3. Some legumes, being quick and vigorous in growth, will check the growth of weeds.
4. They may be used for hay, pasture, or green manure.
5. They are, generally speaking, hardy, drought-resistant, and frost-resistant, thereby assuring a good crop return.

Preparing the Soil for Alfalfa.—The soil **must be well-drained, and must not be acid.** The soil must be ploughed fairly deep, and a **good mulch** must be prepared by plenty of discing, harrowing, and packing. Further, the soil may be **inoculated** with nodule-forming bacteria. This means that the surface soil from a field on which alfalfa has been grown may be scattered over the soil where the alfalfa is to be grown, at the rate of from 100 pounds to 400 pounds per acre. This will ensure a good supply of soil bacteria for the growing crop.

Inoculation is usually performed in the evening, or on a dull day, since direct sunlight will destroy the soil bacteria. Seeding should follow the inoculation immediately.

Preparing the Soil for Red Clover.—Red clover requires a firm, moist, well-drained seed bed of **finely divided** soil particles. It should be well harrowed and well packed. A deep clay loam of good humus content is the most favorable soil for red clover.

Alsike is sown instead of Red Clover on heavy wet soils, since the latter will not grow well under such conditions.

Legume Hays.—The following table, taken from Piper's *Forage Plants and Their Culture*, shows the percentage of digestible nutrients in several kinds of feed:—

| Kind of Feed | Protein | Carbohydrates | Other Extract |
|---------------------------|-------------|---------------|---------------|
| Johnson-Grass | 2.9 | 45.6 | 0.8 |
| Timothy | 2.8 | 42.4 | 1.3 |
| Redtop | 4.8 | 46.9 | 1.0 |
| Bermuda Grass | 6.4 | 44.9 | 1.6 |
| Red Clover | 7.1 | 37.8 | 1.8 |
| Crimson Clover | 10.5 | 34.9 | 1.2 |
| Sweet Clover | 11.9 | 36.7 | 0.5 |
| Alfalfa | 11.4 | 40.0 | 0.8 |
| Bran | 11.9 | 42.0 | 2.5 |
| Shelled Corn | 7.8 | 66.8 | 4.3 |

By comparing the figures given for different feeds in this table one can readily see that, although timothy and alfalfa contain nearly the same amount of carbohydrates, the protein content of alfalfa is about four times that of timothy, and is about equal to that of bran. All of the legume hays are rich in protein. They are therefore good feed for dairy cattle, since milk contains a large amount of protein. When the ration for dairy cattle is grain chops, green feed, and prairie hay or timothy hay, bran is added to increase the protein content of the ration. Alfalfa hay, however, could be substituted for the timothy hay and bran, and costs less. Alfalfa is also very appetizing feed for all kinds of livestock.

Stage at which to cut for Hay.—Alfalfa is cut for hay shortly after the first blossoms appear. At this time the full food value of the plant is obtained. After this time the stems become woody, and the leaflets begin to fall off. In moist regions, where alfalfa blooms but sparingly, it is the rule to cut alfalfa for hay as soon as the new shoots start from the crown of the plant.

Soy beans are cut for hay as soon as the pods are well formed. The percentage of protein is highest when the plant is in full bloom. From that time until the pods are well formed there is a slight lessening of the amount of protein. Thereafter the amount of protein falls off rapidly.

Red Clover is cut for hay in early bloom, in full bloom, or in late bloom. The amount of protein in the hay is greatest when the plant is cut in full bloom; but early cuttings do not cure so well as the later ones.

The Seed Crop.—The second crop of red clover is always the one cut for seed. The second growth produces new shoots from the crown, making the plants more bushy, and there are more pollinating insects during the second growth. As a result, the second crop seeds more heavily than the first crop.

Usually the second crop of alfalfa is the preferred seed crop; but in some parts the second crop will not mature. In the Southwestern United States the third crop is the seed crop.

QUESTIONS AND EXERCISES

1. Dissect a papilionaceous flower. Glue the flower parts, arranged in order, to a page of your booklet. Note the number of petals, the number of stamens, and the appearance of the young pod.
2. In what ways is the nitrogen supply of the soil maintained?
3. Name a dozen wild legumes and a dozen cultivated legumes of Alberta.
4. What is meant by roughage? What are concentrates?
5. What are the advantages of growing legume hay?
6. What is meant by inoculating the soil for legumes?
7. What are bacteria? Name some types of bacteria.
8. Why is the presence of wild vetches and peavine an indication of good soil?
9. Why does white clover make a good lawn?
10. Why does the second growth of legumes produce the best seed crop?

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